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THE

NEW POPULAR EDUCATOR

A Complete Encyclopædia

OF

ELEMENTARY AND ADVANCED EDUCATION.

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CASSELL'S

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GEOGRAPHY.—VII.

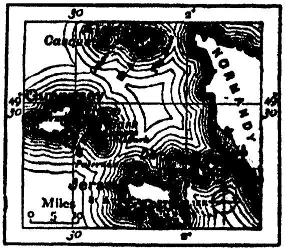
[*Continued from Vol. I., p. 380.*]

THE ISLE OF MAN.

THIS lies almost equidistant from England, Scotland, and Ireland, *Douglas*, on the east coast, being 58 miles from Fleetwood, in Lancashire; and *Peel*, on the west, 65 miles from Belfast. The island lies between 54° 2′ and 54° 25′ N. lat.; and between 4° 18′ and 4° 50′ W. long. It is 33 miles long and 12 wide, and has an area of 227 square miles. Flat in the north, its southern end is mountainous, resembling Cumberland in geological structure, and rising in Snaefell to 2,024 feet. The chief mineral products are argentiferous galena, copper, and zinc; 4,000 tons of lead and 84,000 ounces of silver being produced annually. The climate is very mild, the mean summer temperature being 59° Fahr., and the winter 42°; whilst the rainfall averages 41·7 inches. Agriculture is in an advanced state, 67 per cent. of the area being cultivated, mostly as grass, but also with oats, barley, wheat, and turnips, exclusive of the mountain pasturage. Seaweed is much used as manure. Dairy farming is largely carried on. The absence of venomous reptiles and toads, the occurrence formerly of the great Irish deer and the red deer, and the tailless variety of the domestic cat, are noticeable. There are valuable herring and cod fisheries; and steamers ply to Liverpool, Fleetwood, Barrow-in-Furness, Whitehaven, Silloth (on Solway Firth), Glasgow, Belfast, and Dublin. The government is vested in the "Court of Tynwald," consisting of a governor appointed by the Crown, a council, and the "House of Keys," a body of 24 elected members. The island contributes £10,000 annually towards the imperial army and navy. The population is over 53,000, or over 236 per square mile. The chief towns are *Douglas* [15], *Castletown* [2], the ancient capital; *Ramsey*, a watering-place; and *Peel*, the seat of the herring fishery. The ancient Celtic dialect known as Manx is almost extinct.

THE CHANNEL ISLANDS.

This group of islands, the last relics of the Norman provinces attached to the British Crown at the Conquest (A.D. 1066), is separated by a very shallow sea from Normandy, from which Jersey, the largest, is only 16 miles distant. The principal islands are Jersey, Guernsey, Alderney, Sark, and Herm. *Jersey*, between 49° 10′ and 49° 16′ N. lat., and between 2° and 2° 16′ W. long., is 125 miles from Southampton, and has an area of 45 square miles, being about 11 miles from east to west, and 5½ from north to south. *Guernsey*, between 49° 25′ and 49° 31′ N. lat., and between 2° 30′ and 2° 41′ W. long., is 30 miles from the coast of Normandy, and has an area of 24 square miles. *Alderney*, the most northerly island, 20 miles from Guernsey and 45 from Jersey, is 60 miles from Portland, to which it is connected by a submarine cable. It is 3½ miles long and about a mile wide, having an area of about 4 square miles. *Sark* and *Herm* adjoin Guernsey; and off the west coast of Alderney are the dangerous rocks, *The Casquets*. The total area of the group is about 75 square miles, or one-third that of the Isle of Man. The islands are largely composed of granite and other crystalline rocks, and granite is exported from Guernsey as road-metal. The climate is remarkably genial, frost being rare; and the soil is rich. Seaweed is used as manure. Apples, pears, early potatoes, and grapes (under glass) are largely grown; and the rearing of Alderney cows and butter-making are important industries. Fish are especially plentiful near Guernsey. There is steam communication with Plymouth,



THE CHANNEL ISLANDS.

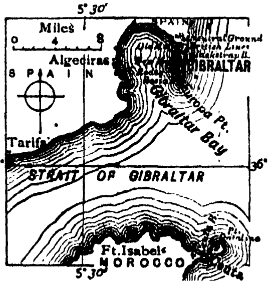
Weymouth (80 miles from Guernsey), and Southampton (140 miles from Guernsey); and with Granville and St. Malo in France. The government is in two "bailiwicks," that of Jersey and that of Guernsey, including the other islands, each under a lieutenant-governor appointed by the Crown; and the "states," an independent legislature, presided over by the bailiff. The population of the islands is about 89,000, the chief towns being *St. Helier's*, Jersey [26], and *St. Peter Port*, Guernsey [16].

HELIGOLAND.

This small island, captured from Denmark in 1807, is in 7° 51′ E. long., and 54° 11′ N. lat., about 25 miles from the mouth of the Elbe, and about 100 from Hamburg. It consists now of two islets, Rock Island and Sandy Island, the latter being a favourite bathing resort for Hamburgers. The area of the islands is about three-quarters of a square mile; and the population is 2,000. With the exception of the governor the officials are native. A Frisian dialect is spoken. Large numbers of lobsters are caught.

GIBRALTAR.

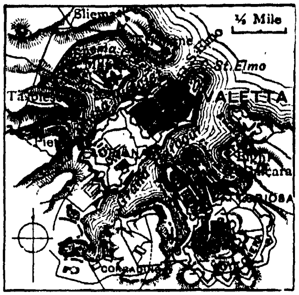
The "Key of the Mediterranean," captured in 1704, is a rocky promontory, 3 miles long, three-quarters of a mile broad, and rising to a height of 1,439 feet, connected with the main land of Spain by a low sandy isthmus of neutral territory. It is situated in 36° 8′ N. lat. and 5° 21′ W. long., so that Gibraltar time is 21 minutes slow by Greenwich. It is 1,209 miles by sea from London, the mail transit occupying five days. The nearest point on the African coast is 14 miles distant. It is so strongly fortified as to be practically impregnable. The population numbers 24,000, including a garrison of between 5,000 and 6,000. Government is entirely in the hands of the governor. As a free port, Gibraltar has an extensive shipping trade. The town lies between Europa and Gibraltar Bays, on the west side of the promontory, which terminates in Europa Point. The climate is sub-tropical; and the Rock is the only European locality in which the Barbary ape occurs wild, great care being taken that the few remaining specimens may not be killed.



GIBRALTAR.

MALTESE ISLANDS.

This group, captured in 1800, consists of the three islands, Malta, Comino, and Gozo, situated between lat. 35° 49′ and 36° 5′ N., and between 14° 12′ and 14° 35′ E. long., 58 miles from Sicily, and about 180 miles from Africa. It is 2,280 miles from London by sea, but only about 1,995 *viâ* Naples, so that the mail transit only occupies four days. Maltese time is nearly an hour fast by Greenwich. Malta, the largest island, is 17¼ miles long, 9¼ broad, and has an area of 95 square miles. Gozo is 9 miles long, 5 broad, and has an area of 20 square miles, that of the whole group being 122 miles, or about two-thirds that of the Isle of Anglesey. The population is about 160,000, besides a garrison of 5,000. The islands are highly cultivated, cotton, corn, oranges, and early potatoes being the principal products. The rocks are of comparatively modern (Eocene) geological age; and the soil, though fertile, is often very thin, being in places terraced to preserve it from the winter rains. The climate is sub-tropical, the fan-palm growing wild, and the prickly-pear cactus being abundant. Goats are kept, but few cows. No part of the islands rises more than 750 feet above sea-level. *Medina*, now known as *Citta Vecchia*, in the interior, the former capital, is superseded by *Valetta* (with which it is connected by a railroad), with one of the finest harbours in the world. It is strongly fortified, has an excellent arsenal and naval hospital, is the chief station of our Mediterranean fleet, an important coaling station, and has a shipping trade equal to that of Gibraltar. Malta is a Crown colony, the government being vested in a governor and council, the latter partly elective. The natives are a mixed race, speaking a corrupt Italian, with a large admixture of Arabic.



HARBOUR OF VALETTA.

THE ASIATIC POSSESSIONS OF GREAT BRITAIN.[*]

CYPRUS, an island of the Levant, or eastern part of the Mediterranean Sea, is 41 miles from Latakia, on the coast of Syria, with which it is connected by cable, and 238 north of Port Said, the entrance to the Suez Canal. It lies between 34° 30′ and

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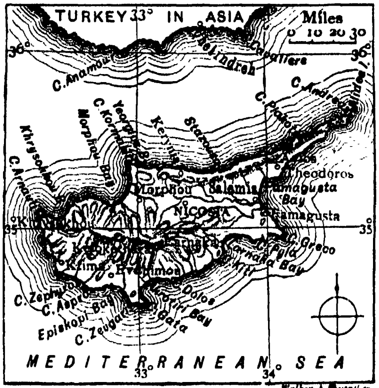
[*] For tabular enumeration of these *see* Vol. I., p. 76.

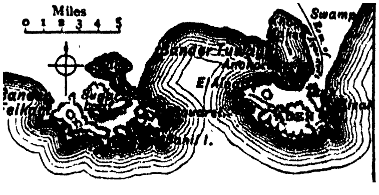
35° 41′ N. lat., and between 32° 15′ and 34° 35′ E. long., so that time is rather more than two hours in advance of Greenwich. The island is roughly speaking an oblong, 100 miles long and 50 broad, but a narrow promontory extends 40 miles from its N.E. extremity. Its area exceeds 3,700 square miles, about half that of Wales. The climate is hot and dry, so that the naturally fertile but badly irrigated soil is parched. The north coast is mountainous, ending eastwards in Cape Andreas, and in the interior Mount Olympus rises to 6,590 feet. From Famagusta Bay, on the east coast, a plain extends in which is the capital Nicosia or Lefkosia. The population numbers over 186,000, or 50 per square mile, one quarter of whom are Mohammedans. Cotton of good quality, wine, carobs or locust beans, corn, and wool are exported, but only one-third of the cultivable land is tilled. Copper, marble, and granite are quarried, and large quantities of salt obtained from lakes, near Larnaka and Limasol. Cyprus forms part of the Turkish Empire, but has been administered since 1878 by an English Commissioner, assisted by a partly elective Council. The chief towns are *Nicosia* [11], on the River Pedæus, *Larnaka* [7], and *Limasol* [6]. The mails from London, *viâ* Brindisi, occupy eight to eleven days in transit, but the distance *viâ* Gibraltar and Malta is about 4,000 miles.



Walker & Boutall sc.

Cyprus.

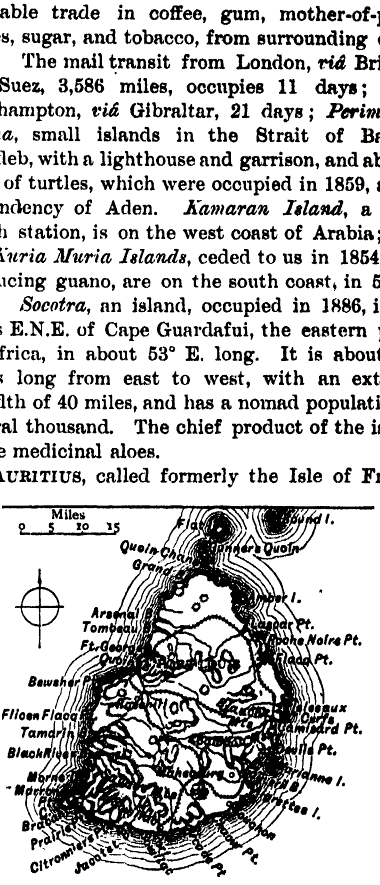
Aden, captured in 1839, is a peninsula and town on the south coast of Arabia, about 100 miles east of the Straits of Bab-el-Mandeb ("the Gate of Tears"), situated in 12° 47′ N. lat. and 45° 10′ E. long., time being, therefore, three hours fast by Greenwich. The territory under British control is about 66 square miles. The climate is excessively hot and dry, and the town is situated 123 feet above the sea, in the crater of an extinct volcano to the east of a fine natural harbour. The population, including the garrison, numbers about 35,000. The government is conducted by a resident, under the Governor of Bombay, 1,635 miles distant. Aden is valuable as a coaling station, and as commanding the Red Sea; is strongly fortified; and has considerable trade in coffee, gum, mother-of-pearl, spices, sugar, and tobacco, from surrounding countries. The mail transit from London, *viâ* Brindisi and Suez, 3,586 miles, occupies 11 days; from Southampton, *viâ* Gibraltar, 21 days; *Perim* and *Mosha*, small islands in the Strait of Bab-el-Mandeb, with a lighthouse and garrison, and abundance of turtles, which were occupied in 1859, are a dependency of Aden. *Kamaran Island*, a telegraph station, is on the west coast of Arabia; and the *Kuria Muria Islands*, ceded to us in 1854, and producing guano, are on the south coast, in 56° E. long. *Socotra*, an island, occupied in 1886, is 150 miles E.N.E. of Cape Guardafui, the eastern point of Africa, in about 53° E. long. It is about 138 miles long from east to west, with an extreme breadth of 40 miles, and has a nomad population of several thousand. The chief product of the island is the medicinal aloes.



Walker & Boutall sc.

Aden.

Mauritius, called formerly the Isle of France (sometimes mentioned amongst our African possessions), taken from the French in 1810, is an island in the Indian Ocean, in about 20° S. lat. and 57° E.



Mauritius.

long. It has an area exceeding 700 square miles; a climate once so healthy that the island was the sanatorium of India, but now somewhat deteriorated owing to excessive forest-clearing, and liable to destructive hurricanes; a mountainous interior, rising, in Peter Botte Mount, nearly to 3,000 feet, and a fertile soil. The population exceeds 370,000, or 520 per square mile, more than two-thirds of whom are Indian coolies brought to work on the sugar plantations. Sugar and rum are by far the most important productions of the island. Almost all the trade passes through *Port Louis* [64], the capital, on the N.W. coast, which has a fine harbour. Trade is carried on with Bombay, 2,500 miles distant, and there are 94 miles of railway in the island. Mail transit from England, *viâ* Marseilles and Suez, 7,010 miles, occupies 24 days. Government is administered by a Governor, with an Executive Council and a partly elective Legislative Council. *Rodriguez*, a hilly island, 300 miles east of Mauritius, 42 square miles in area, with a population of 1,400, is a dependency of Mauritius under a Commissioner. The *Seychelles*, a group of mountainous but fertile islands on a coral bank, in lat. 55° E. and long. 5° S., with an area of 90 square miles, and a population of 14,000, ceded to us in 1814, and celebrated for the double cocoa-nut, or "coco-de-mer," are similarly governed. The chief island is *Mahé*, on which is the capital *Victoria*, with a good harbour, 970 miles from Port Louis and 1,395 from Aden, and a garrison. Transit from London occupies 22 days. The low-lying waterless *Amirante Islands*, to the west, yield turtles. The coralline *Chagos Islands* lie nearly 20° E. of the Seychelles. The uninhabited barren volcanic islands of *St. Paul* and *New Amsterdam*, mid-way between Cape Colony and Australia, in lat. 37° S. and long. 77° 30′ E., and the larger *Kerguelen* and *Heard Island*, still farther south, are of no importance.

THE INDIAN EMPIRE occupies the central peninsula of southern Asia, the western part of the eastern peninsula, and a large area to the north of these peninsulas. It lies between the Equator and 37° N. lat. and between 66° 57′ and 103° E. long., its extreme points being Kashmir in the north, the Maldive Islands in the south, Kurrachee in the west, and the Shan States in the east. The meridian of Cape Comorin, 77° 33′ E., is about the centre of the main peninsula, and the Tropic of Cancer, 23° 30′ N., is approximately the centre parallel. Half of India is thus within the tropics, and almost its whole area is farther south than any part of Europe.

The main mass of India proper is quadrangular in outline, the diagonal from the north of Kashmir to Cape Comorin (lat. 8° N.), measuring about 29° or nearly 2,000 miles. The area of this main mass, almost the whole of which is now more or less completely under British control, is 1,298,320 square miles, or nearly sixteen times the area of Great Britain; and adding to this 87,220 square miles, the area of Lower Burma, formerly known as British Burma, and 200,000 square miles estimated as that of Upper Burma with its dependent Shan States, constituting the Kingdom of Burma, annexed in 1886, we have a total area of 1,585,540 square miles, equal to eighteen times that of Great Britain, or nearly that of Europe, exclusive of Russia.

Boundaries and Coast-line.—On the north and north-east, India is so shut in by the Himálaya and other mountain ranges that there is but little communication even for trade with the countries beyond. The passes in the Himálaya are at an average altitude of 17,000 feet above sea-level. The north-west frontier is slightly less impregnable. The Mustagh Pass to the north of Kashmir is at a height of 18,435 feet; the celebrated Khyber Pass, traversed by the Kabul river, about thirty miles long, between Peshawar and Jelalabad, in Afghanistan, which has so often been obstinately contested, is only 3,373 feet; the Kurrum Valley, farther south, the Gwalari Pass, near Dera Ismail Khan, and the Tál Pass, debouching near Dera Ghazi Khan, through the Suleman Mountains, open into the desert of the Punjab; and the east end of the Bolan Pass, between Dadur and Quetta, 5,793 feet in altitude and 59 miles long, is approached by the railroad from Kurrachee, Hyderabad, and Shikarpûr. South of this the lower Hála mountains divide Sind from Baluchistan. The coast-line measures nearly 5,000 miles, measured from Kurrachee to the Isthmus of Kra in Tenasserim, which gives only one mile to every 317 square miles of area. The west coast, facing the Arabian Sea, is the most indented. South of the port of Kurrachee are the mouths of the river Indus and the Gulf of Cutch, opening into the great marsh or Rann of Cutch, behind the island of the same name. South of the peninsula of Kathiawar is the Gulf of Cambay with the port of Surat, and, farther south, that of Bombay. The south-west coast is known as the Malabar coast. Its chief ports are Mangalore, Calicut, Beypore, and Cochin. The Laccadive Islands are a coral group, 150 miles west of this coast, north of the 10° parallel, and the Maldive Islands are 200 miles south-west of Cape Comorin. Between the Equator and 8° N. E. of Cape Comorin is the Gulf of Manaar, celebrated for its pearl fisheries, divided by the islands of Manaar and Ramesvaram and the chain of sandbanks known as Adam's Bridge from Palk Strait, which with the Gulf separates India from Ceylon. The east coast

Kinchinjinga.

from Palk Strait to the mouth of the Kistna, facing the Sea of Bengal, is called the Coromandel Coast. Its chief ports are Negapatam, the French Pondicherry, and Madras. From the Kistna to the Godavery the coast is called the Golconda Coast, the chief port being Masulipatam, and that farther north, facing the Bay of Bengal, is known as the Orissa Coast, on which are the ports of Coringa and Vizagapatam. The eastern shores of the Bay of Bengal are mostly rocky, the chief ports being Rangoon, on one of the mouths of the Irrawaddy, and Moulmein at the mouth of the Salween River.

Natural Divisions.—India falls naturally into four physical divisions: the Himálayan region; the great river-plains of the north, or Hindustán; the three-sided plateau of the southern peninsula, or Deccan; and Further India. These regions, as might be supposed, differ widely in climatic, geological, and industrial conditions.

Surface and drainage.—The Himálayas ("Dwelling-place of frost," from Sanskrit *hima*, frost, and *álaya*, a house), the loftiest range in the world, consists of several parallel ranges, rising precipitously on their southern slope to an average height of 20,000 feet, or nearly four miles, with a mean breadth of 150 miles, and extending from north-west to south-east nearly 1,500 miles from the defile traversed by the Indus to that through which the Brahmaputra or Sanpo enters Assam. The three loftiest mountain-peaks yet measured on the globe, ***Mount Everest***, 29,002 feet, or nearly 5½ miles; ***Kinchinjinga***, 27,815 feet; and ***Dhawalagiri***, over 26,826 feet; and fifteen others over 25,000 feet, or about 4¾ miles, occur in the southern of these ranges.

Four great rivers rise in the Himálayas at no great distance apart, three of them north of the main range—viz., the Indus, which flows north-westward through Ladakh and Kashmir, then turning abruptly south-westward through the Punjáb and Sind; the Sutlej, turning more directly south-westward, and joining the Indus in the south of the Punjáb; the Sanpo or Brahmaputra, flowing south-eastward until it turns south-westward through Assam; and lastly, the Ganges, draining the southern slope of the range. The Indus, rising at an altitude of 22,000 feet, becomes navigable at Attock, its confluence with the Kabul River, 870 miles from the source, below which point its course is mainly through a plain liable to floods, in which it often changes its channel. At 1,380 miles from its source it receives the Punjnad, below which it is shallow, and therefore difficult to navigate, but never less than 2,000 yards wide; and at Tatta, the head of its delta, below Hyderabad, 70 miles from the sea, it becomes tidal, its whole course being about 1,800 miles, and its drainage area about 415,000 square miles. The

Jhelum, 450 miles long, and the Chenab, 605 miles, both rising in Kashmir, unite, after which they receive the Ravi (450 miles) from above Lahore, and, passing Multán, the Ghara (850 miles), from the Himálaya, which is formed by the confluence, 300 miles higher up, of the Sutlej (550 miles) and the Beas. These five streams, Punjnad (Sanskrit, *panj*, five), give the country the name of the Punjáb, and the plain between any two of them is termed a Doáb. The mountain barrier west of this river-plain culminates in the Tàkht-i-Sulemán (Throne of Solomon), 11,317 feet, or over two miles high. Along the foot of the Himálayas is the Terai, a broad belt saturated by springs with luxuriant vegetation and abundance of wild animals, but so malarious as to be fatal to man. The Ganges rises in the Himálaya, 14,000 feet above sea-level; is separated from the Sutlej basin by the Siwalik Hills, a range reaching 3,500 feet, and, passing Cawnpore, receives at Allahabád, 670 miles from its source, the Jumna (860 miles), a more torrential stream, almost as large, from Delhi and Agra. The lowest point in the watershed between the Indus and Ganges, 850 miles from the mouth of the former and 1,050 from that of the latter, is only 924 feet above sea-level. The Chambal (570 miles), rising in the Vindhya Mountains and the plateau of Malwa, and flowing north-eastward, with tributaries from the Aravali Mountains between Oudeypore and Ajmore, is the chief tributary of the Jumna. From Allahabád the Ganges flows through a vast plain, past Benares and Patna, receiving its chief affluents from the north, and forming at once the chief highway, aqueduct, and fertiliser of Bengal; until, with the Brahmaputra (1,750 miles), it breaks up into the innumerable streams of a delta as large as Ireland; and, after a course of 1,500 miles, 1,300 of which are navigable for boats, adds largely by its sediment to the shore at its mouths in the district known as the Sunderbuns. A tidal wave, or bore, five feet high at Calcutta, rushes up the mouth known as the Hooghly.

South of the great northern river-plain rises the triangular table-land of the Deccan, varying in altitude from 2,000 to more than 3,000 feet, and occupying almost all the peninsula. Its northern boundary is the Vindhya Range (2,000 feet), nearly 150 miles long, but continuous with the basaltic hills of Rajmahal and Sylhet on either side of the Ganges delta. South of this range, the Nerbudda (800 miles) and Tapti (440 miles) Rivers, separated by the Satpura Mountains, flow westward to Broach and Surat on the Gulf of Cambay. South of the Tapti, the Western Ghats* form a bold chain near the coast, rising from 2,000 feet to 4,700 feet at Mahabaleshwar, and 7,000 feet near Coorg, and passing into the Nilgiri Hills, which culminate in Dodabetta (8,640 feet), and the Kunda Mountains which join the Eastern Ghats. To the south is the Palghat Gap, 25 miles wide and less than 1,000 feet high, through which passes the railway from Calicut to Trichinopoly, and then the Travancore Hills extend to Cape Comorin. The Eastern Ghats are lower, averaging 1,500 feet, are farther from the coast, and are cut through by the Cauvery (472 miles), the Kistna (800 miles), and the Godavari (900 miles), which drain the Deccan into the Sea of Bengal. North of this chain is the delta of the Mahanadi (520 miles). The rivers of the Deccan are mostly rapid and difficult to navigate.

Further India, or Burma, is drained mainly by the two north and south rivers the Irrawaddy (1,100 miles) and the Salween, a third, the Mekong, traversing the Shan States in the extreme east. The basin of the Irrawaddy is separated from that of the Brahmaputra by the Patkoi Mountains and Manipur Hills, which extend southward as the Arakan Yoma Mountains.

Geological structure.—But little can be said here as to the complex geology of India. The Hála Mountains in the west contain beds representing most of the great European formations, from the Silurian upwards, without any apparent break in the succession. The Himálayas contain a similar series in the valley between the gneiss axes of Ladakh and the southern range, probably upheaved and contorted soon after the deposit of the Eocene limestone. Then also originated the depression of the Indo-Gangetic plain, the river-deposits in which are perhaps more than 1,800 feet thick. Extensive coal-fields occur in Central India, and much of the Deccan is covered with sheets of basaltic rock of Cretaceous and Eocene age, in places 6,000 feet thick.

LATIN.—VII.

[*Continued from Vol. I., p.* 370.]

TRANSLATION.

We now propose, instead of giving you any more collections of brief sentences to translate, to set you passages taken from Latin authors. At first these passages will present considerable difficulties to you, especially as hitherto you have learnt nothing of Latin *syntax*, except the most elementary rules of concord. We shall, however, endeavour to smooth the way for you by giving you brief notes whenever we deem it necessary. We intend to prefix to each passage some account of the work from which it is taken, and of the

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"Ghat" means a stair or mountain-pass.

author who wrote it, in the hope that you may thus be induced to take more than a mere "schoolboy" interest in Latin literature. By this time you have no doubt realised that the order of words in a Latin sentence by no means corresponds to the order of words in an English sentence, so that if you translate a Latin sentence with absolute accuracy into English without changing the order of the words you will generally succeed in producing a piece of nonsense. You must, therefore, in translating from Latin into English, take the words in an order which conforms to the English usage. Bearing this in mind, you will be led to look first of all for the nominative case or subject of the principal verb in the sentence, then for the principal verb itself, and then for the direct and remoter objects, if they exist in the sentence. Having found these, which may be said to form the skeleton of the sentence, you will have little trouble in putting the other words in their places. Remember that relative and subordinate sentences should be treated separately.

There are one or two further hints which you may find useful in translating from Latin into English.

(1) Make up your mind that the Latin authors from whom you are translating never wrote nonsense. A Latin word may often have alternative translations in English, and if one interpretation fails to make sense, always try another. The whole skill of a translator consists in catching the meaning of the author whose work is to be translated, and this skill can only be acquired by years of practice; at the same time many blunders may be avoided by never losing sight of the fact that a translation from Latin is never satisfactory unless it yields a consistent and intelligible meaning.

(2) In translating avoid *fine language*. Render the Latin into plain simple English. You will no doubt find it a useful practice first of all to make a rigidly literal translation of the passage set before you, and then to improve your own version, making the English more idiomatic, but never attempting to render it ornate.

(3) Do not be afraid of looking words out in your Latin dictionary. It is, perhaps, a little troublesome at first, but after a time you will get very quick at finding your way about from letter to letter. When you have turned up a word, do not be content with finding out its bare meaning; discover its declension or conjugation, and also the various meanings which it assumes in different connections.

OVID.

Our first extract will be taken from Ovid, a poet distinguished not only for the melodious beauty and clear simplicity of his verse, but also for the surprising quantity of his writings. He is by far the most voluminous of the Roman poets, and yet he never seems to have exhausted his poetic vein, his poetry being singularly equal throughout. He lived in the early years of the Roman Empire, a period peculiarly prolific in great poets, of whom he is by no means the least famous. After living some years at Rome in familiar intercourse with the chief literary men of the day, and in the enjoyment of the patronage of the emperor, he was suddenly banished, for some reason that has never been divulged, to Tomi, a wild uncivilised place on the shores of the Black Sea. Fortunately for posterity, his dreary banishment did not stop his literary career, and many of his most beautiful poems were given to the world from his place of exile, where he died in the year A.D. 18. The works of Ovid are always considered the very best model for elegiac verse-writing, every one of the laws which govern that rhythm being studiously obeyed, with a remarkable absence of any appearance of constraint. The grammatical constructions are remarkably simple and straightforward, and for the most part there is very little difficulty either in apprehending the meaning or appreciating the beauty of Ovid's poems. The great German historian Niebuhr remarks of him: "No one can have had a greater talent or a greater facility for writing than Ovid had. In this respect he may rank among the greatest poets. This is the kind of poetry in which everyone feels at home, and as if the sentiments could not be expressed in any other way. Horace is much inferior to Ovid in this respect; there are only a few among his lyric poems of which we can say that they were composed with ease and facility."

The following passage is taken from one of Ovid's most important works, entitled the "Fasti." The "Fasti," which formed a metrical Roman Calendar, includes an account of the most important festivals which annually took place at Rome, and of the numerous myths and traditions associated with them.

The extract ("Fasti" ii.), gives an account of the way in which Romulus (the supposed founder of Rome) and Remus were exposed by their great uncle Amulius. Livy, in his account of the foundation of Rome (i. 3), tells us how Proca King of Alba left two sons, Numitor and Amulius. Numitor was the elder, and should have been king, but Amulius, who was of a grasping disposition, managed to depose his brother and kill his sons. Rea Silvia, however, the daughter of Numitor, had twin sons, Romulus and Remus, and as soon as they were born Amulius ordered them to be exposed on the banks of the Tiber, hoping that they would soon be drowned. Ovid tells us what happened:—

"Haec ubi cognovit contemptor Amulius aequi,
Nam raptas fratri victor habebat opes;
Auferri jussit parvos, et in amne necari.
Quid facis? Ex istis Romulus alter erit.
Jussa recusantes peragunt lacrimosa ministri:
Flent tamen, et geminos in loca jussa ferunt.
Albula, quem Tiberim mersus Tiberinus in unda
Reddidit, hibernis forte tumebat aquis.
Huc ubi venerunt, nec jam procedere possunt
Longius, ex illis unus, an alter, ait:
'At quam sunt similes! at quam formosus uterque!
Plus tamen ex illis iste vigoris habet.
Si genus arguitur vultu, ni fallit imago,
Nescio quem vobis suspicor esse deum.
At si quis vestrae deus esset originis auctor
In tam praecipiti tempore ferret opem.
Ferret opem certe, si non ope mater egeret;
Quae facta est uno mater et orba die.
Nata simul, peritura simul, simul ite sub undas
Corpora.' Desierat deposuitque sinu.
Vagierunt clamore pari; sensisse putares;
Hi redeunt udis in sua tecta genis.
Sustinet impositos summa cavus alveus unda:
Heu! quantum fati parva tabella vehit!"

NOTES.

1. *Haec ubi cognovit.* "When he learnt this (news)"—*i.e.*, of the birth of Romulus and Remus; *cognovit* is from *cognosco.*

   Aequi. Genitive after *contemptor; aequum*, the neuter of the adj. *aequus*, is used as a substantive = right, justice.

2. *Raptas*, from *rapio; raptas habebat* is almost equivalent to an English auxiliary verb with a passive participle, "had snatched."

   Opes. "Power, wealth," a noun of which the nom. sing. *ops* rarely occurs. Other cases of the singular occur below in lines 16 and 17, where the word means "help."

3. *Auferri.* Inf. pres. pass. of *aufero*, an irregular compound verb from *fero.* The simple verb occurs in lines 6, 16, 17—*ferunt* (ind. pres.), *ferret* (subj. imperf.).

4. *Ex istis alter.* "One of them"—*i.e.*, of the two children.

5. *Jussa.* Perf. participle pass. of *jubeo*, used as a substantive.

   Recusantes. "Protesting"—*i.e.*, unwillingly.

7. *Albula*, &c. The legend was that Tiberinus King of Alba had been drowned in the river Albula, which henceforth bore his name Tiberinus, or Tiberis; *reddidit*, "made"—*i.e.*, gave the name to.

8. *Forte.* Abl. of *fors*, used as an adverb, "by chaxce."

9. *Nec = et non; nec jam* must be taken together, "and (they could) not any longer."

   Possunt. From the irregular verb *possum*, "I am able," which is conjugated like *sum.*

10. *Ex illis unus, an alter.* "One or other of them"—*i.e.*, of the *ministri.*

11. *At quam.* "But how like they are!"

12. *Iste.* Romulus; *plus vigoris* must be taken together, "more (of) strength."

13. *Genus.* "Birth, descent"; from this some word like *patrem* must be understood in the next line.

    Ni = nisi; ni fallit imago. "Unless the likeness deceives (me)."

14. *Nescio quem.* "I know not whom." This expression is used in Latin for "some one or other"; here, "I suspect that some god or other is to you (a father)."

15. *Si quis . . esset . . ferret.* A conditional sentence; "if he were, he would bring," so in line 17.

16. *In tam praecipiti tempore.* "In so dangerous a time."

17. *Egeret.* Verbs of plenty and want take the ablative.

18. *Facta est.* From the irregular verb *fio* = "has become."

    Orba. "Deprived (of her children)."

19. *Nata simul.* Agreeing with *corpora*, and supposed to be addressed to the children; *nata*, from *nascor*; *peritura*, fut. part from *pereo*, a compound irregular verb; *ite* is the imperative of the simple verb; cf. *redeunt* in line 22.

20. *Desierat.* Pluperf. from *desino.*

    Deposuit. Perf. from *depono.*

21 *Putares.* "You (the reader) might think that they felt."

22. *Hi.* The servants sent to expose the children.

    Udis genis. "With cheeks wet," a use of the case called Ablative Absolute.

23. *Cavus alveus.* "The hollow cradle," they were supposed to have been exposed in their cradle, which floated "on the top of the water" (*summā undā*).

24. *Quantum fati* must be translated together, like *plus vigoris*, in line 12. "How much of fate"—*i.e.*, "What mighty fortunes."

    Tabella. "Plank"—*i.e.*, the cradle.

FORMATION OF TENSES (*continued*).

g. Present Participle.—The present participle is formed by adding *-ent* to the present stem. In the nominative singular this is *-ens*. The *e* of the suffix *-ent* is lost by contraction in the *a* of the stem of the first conjugation, so that we get *ămans*, not *amens.*

h. The Gerund and Gerundive.—These verbals are formed by adding *-end* to the present stem. Just as the *-ent* of the present participle becomes *-ant* in the first conjugation, so in that conjugation the *-end* of the gerund becomes *-and*—*e.g.*, am*andum.*

THE PERFECT.

In Latin there are five methods of forming the perfect:—

(1) By reduplication, that is, by prefixing the initial consonant of the stem followed by a short vowel. If the vowel of the stem is *a* or *e* this short vowel is *e;* if, on the other hand, the vowel of the stem is *o*, *u*, or *i*, then *o*, *u*, or *i* appears in the reduplicated syllable. With regard to reduplication, one other point is to be borne in mind. If the stem begins with *sc, sp, st*, both the consonants are

repeated in the reduplicated syllable. Examples of reduplicated perfect stems:—*cecini* (stem *can-*); *fefelli* (stem *fall-*); *momordi* (stem *mord-*); *cucurri* (stem *curr-*); *steti* (stem *sta-*); *spopondi* (stem *spond-*).

(2) By lengthening the vowel of the stem, or by substituting another vowel lengthened for the short vowel of the stem. Thus *ă* may be altered to *ē*. Examples:—*lāvi* (stem *lăv-*); *ēgi* (stem *ăg-*); *fēci* (stem *făc-*); *jēci* (stem *jăc-*); *jūvi* (stem *jŭv-*).

(3) By adding *s* to the stem. This *s* is a weakening of *es*, which is from the stem *es-*, as seen in *eram* (= *esam*). The perfect in *s* is therefore a composite tense. Examples:—*scripsi* (= *scrib-si*, from stem *scrib-*); *fixi* (= *fig-si*, from stem *fig-*); *junxi* (= *jung-si*, from stem *jung-*). It must be remembered that in the formation of perfect stems by the addition of *s*, *b* becomes *p*, and *gs*, *cs*, are written *x*.

(4) By suffixing *-ui* or *-vi* to the stem. This suffix is said to come from a stem *fu-*, which is seen in *fui*, and has the same force as the stem *es-* by the addition of which, as we have shown, perfect stems in *s* are formed. Examples:—*amavi* (stem *ama-*); *monui* (= *mon(e)ui*, from stem *mone-*); *audivi* (stem *audi-*).

(5) By merely adding an inflectional *i*, and neither adding to nor changing the stem of the verb. Examples:—*mandi* (stem *mand-*); *scandi* (stem *scand-*). This method of forming the perfect may be explained on the ground that the reduplication has dropped off. But the explanation is doubtful.

TENSES FORMED FROM THE PERFECT.

The perfect subjunctive is formed by adding *-erim* (= *esim*, an old form of *sim*), to the perfect stem—*e.g.*, *amāv-ĕrim*.

The perfect infinitive ends in *-isse*. which stands for *-is-ese*, *-is-* being an inflectional ending characteristic of the perfect, and *-ese* the ordinary termination of the infinitive, which as *-ere* is seen in *reg-ere*, &c.

The pluperfect indicative is formed by adding *-eram* to the perfect stem—*e.g.*, *amāv-ĕram*.

The pluperfect subjunctive is formed by adding *-essem* to the perfect stem, an *i* being inserted between the stem and the suffix. Thus *amāvissem* = *amāv-i-essem*.

The future perfect is formed by adding *-ero* to the stem—*e.g.*, *amāv-ero*. The third person plural of the future perfect ends in *-erint*, not *-erunt*, as might be expected. The reason, no doubt, of this variation is to make a distinction between this form and *amaverunt*, the third person plural of the perfect indicative.

It will be seen from what we have said that the tenses formed from the perfect are in reality compound tenses, made up of the perfect stem and the tenses of *esse*, *to be*. You will perhaps have found some difficulty in following the explanations we have given concerning the formation of tenses, and until you have a slight acquaintance with the principles of philology there are several points which can scarcely be quite clear to you. At the same time it seems advisable to us that you should know at the outset that the inflections which are found in Latin verbs have a distinct meaning, and that the tenses are built up upon recognised rules.

THE SUPINE.

The formation of the supine presents but little difficulty. The general rule is:—Add *-to-* to the verb stem, and you will get the supine *stem*—*e.g.*, *ama-to-*, *lec-to-* (stem, *leg-*). It must be remembered that *g* or *h* before *t* become *c*, as in *lectum* (= *leg-tum*), *vectum* (= *veh-tum*). Other slight changes take place in the stem of the verb in the formation of the supine. These changes are always prompted by a desire to evade a conjunction of sounds which would be difficult to pronounce. Sometimes an *s* is found in the supine stem instead of a *t*. The future participle is formed by adding *-urus* to the supine stem.

The formation of the tenses of the passive verb present little difficulty. It will be well to observe that the compound tenses in the passive are formed from the supine stem.

THE PRINCIPAL PARTS OF THE VERB.

In order to conjugate a verb you must know—

(1) The *Present Indicative*, from which you will have no difficulty in inferring all the tenses formed from the present stem.

(2) The *Perfect Indicative*, the stem of which will enable you to form all the perfect tenses.

(3) The *Supine*, which will tell you what the past participle is, and so give you a key to all the compound tenses of the passive.

(4) The *Infinitive*. From this you can discover the stem of the verb. You will then have no doubt as to the conjugation to which a verb belongs, and you will know which is its characteristic vowel.

As they give a clue to the conjugation of the whole verb these four forms are very properly known as *the principal parts of the verb*. If you know these four forms, and study the models of verbs which we have given you, you will have no difficulty in conjugating all the Latin verbs, with the exception of a few irregular and defective verbs. which will be set before you in detail later on. We have told you above that there are five methods of forming the perfect of the Latin verb. You will have noticed that the 1st, 2nd, and 4th conjugations in the models which we set before you all formed their perfects by the 4th method, *i.e.*, by adding *-ui* or *-vi*. Verbs of the 3rd conjugation form their perfect in all of the other methods, and no rule can be laid down. Nor are the 1st, 2nd, and 4th conjugations without deviations, as far as perfect is concerned. And as it is with the perfect, so it is with the supine. Certain deviations occur in each conjugation. For instance, we find some verbs of the 1st conjugation with reduplicated perfects, others with supines in *-ĭtum* or *-tum*, instead of *-ātum*. In the same manner deviations occur in all the other conjugations, so that if you are ever to have a clear understanding of the Latin verb you must not be content to learn the four model conjugations given above, but you must also make up your mind to master the principal parts of all those verbs which deviate from these models. We readily grant that at first sight it seems a tedious thing to "get up" the long lists which follow, but it is not nearly so formidable an achievement as it appears. Besides, you can materially lessen your labour by making up your mind to learn a certain number, say ten or fifteen, every day. You will thus find that you do not overburden your memory, as you would do if you attempted the almost hopeless task of learning the whole list at once. At the same time you ought to be encouraged in your task by the reflection that when once you have mastered the list given below you can conjugate without any difficulty any verb in the Latin language, and that in translating you can easily recognise any part of any verb which a Latin author may employ.

FIRST CONJUGATION.

Reduplicated perfect:

Stō	stĕtī	stătum [*but* stătūrus]	stāre	*stand*
Cōnstō	cōnstĭtī		cōnstāre	*stand firm.*

Perfect formed by lengthening stem-vowel:

Jŭvō	jūvī	jūtum	jŭvāre	*help.*
Lăvō	lāvī	lăvātum	lăvāre	*wash.*

Perfect formed by suffixing *-ui:*

Crĕpō	crepuī	crepĭtum	crepāre	*rattle.*
Cŭbō	cubuī *or* cubāvī	cubĭtum	cubāre	*lie down.*
Dŏmō	domuī	domĭtum	domāre	*tame.*
Frĭcō	fricuī	frictum	fricāre	*rub.*
Mĭcō	micuī		micāre	*quiver, flash.*
Ex-plĭcō	ex-plicāvī *or* ex-plicuī	ex-plicātum *or* ex-plicĭtum	ex-plicāre	*un-fold.*
Pōtō	potāvī	potātum *or* pōtum	potāre	*drink.*
Sĕcō	secuī	sectum	secāre	*cut.*
Sŏnō	sonuī	sonĭtum	sonāre	*sound.*
Rĕsŏnō	resonāvī		resonāre	*re-sound.*
Tŏnāt	tonuit		tonare	*thunder.*

KEY TO EXERCISE.

Ex. 16.—1. Your affairs are at stake when the next wall is burning. 2. Who has written this letter? 3. It pleases every good man to aid the wretched. 4. You, since it is now night, depart to your homes (roofs). 5. Paetus gave to me all the books which his brother had left. 6. Choose which of the two is suitable to you. 7. There are many who take away from some that which they bestow upon others. 8. If you are hard-hearted, decline; but if you are not hard, come. 9. I sing to girls and boys songs not heard before. 10. He does not seem to me to be free who does not sometimes do nothing. 11. You wage wars with more bravery than good fortune (lit., more bravely than more fortunately). 12. Cæsar straightway sent back the ambassadors.

1. De me multa falsa audierunt. 2. Cave canem. 3. Fortunatus sibi Damocles videbatur. 4. Naturam si sequemur ducem, nunquam aberrabimus. 5. Dixit melius quam scripsit Hortensius. 6. Terra tremit. 7. Cogite oves, pueri. 8. De puteo aquam haec hauriebat. 9. Sapiens calamitatem contemnit. 10. Cicero eloquentissimus Romanorum dicebatur. 11. Quid agis, mi amice? 12. Nullam aquam aperiebamus.

DRAWING.—VII.

[*Continued from Vol. I., p.* 346.]

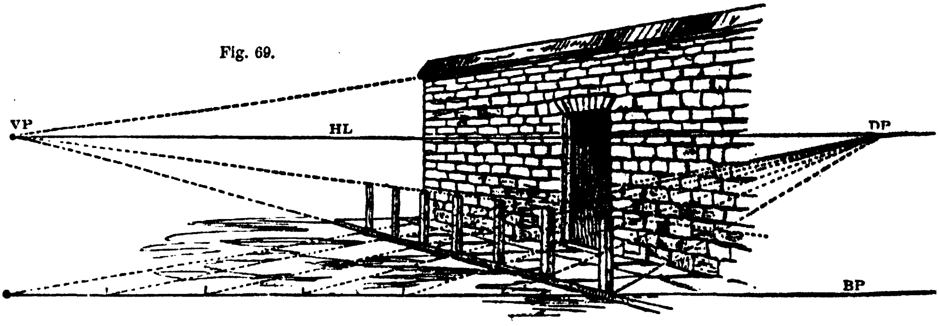
SHADOWS.

HAVING shown, as we promised, how the retiring horizontal distances of objects may be faithfully represented on paper, we will give some examples as subjects for exercise. Fig. 69 is an example of a retiring row of posts, their distances being *purposely* shown by the geometric method of the last two problems. It is almost needless to direct the attention of the pupil to the diminishing retiring spaces between the posts; however, he will see, as we have previously endeavoured to make clear to him, that those retiring distances can be satisfactorily proved. Fig. 70 is given as an exercise, including many of the principles we have before explained—viz., angular perspective, horizontal retiring lines, inclined lines of the roofs, and horizontal retiring distances, all of which the pupil, we trust, will now be able to arrange for himself, and to find his vanishing points.

We have now to take up a fresh branch of study. So far we have only spoken of straight lines and curves, and the forms they represent; now we turn to shading, or the treatment of masses of various gradations of tone. Here, therefore, in addition to the sense of appreciation of form, the student must cultivate appreciation of what are called *values*, or the relative strength of one tone as compared with another.

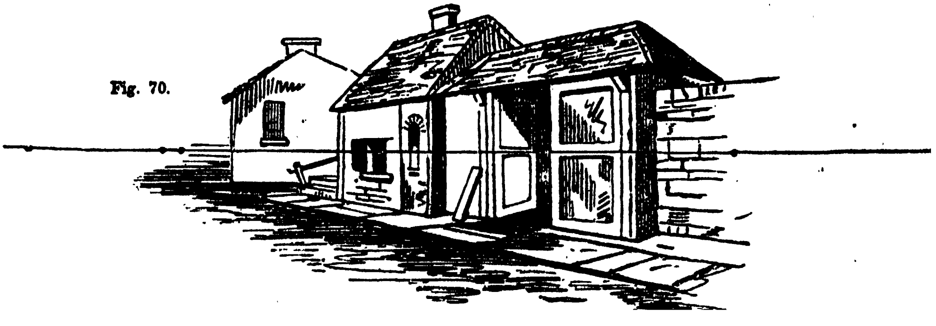
In the early examples these differences will be clearly defined for the help of the pupil; but we should wish him to pursue this study for himself, by constantly bearing it in mind when he is looking at nature or at any bit of still-life in the room he occupies. Let him reduce what he sees into black and white, noticing where the darkest point is, where the lightest, where the middle tint, and so on. In this way he will learn to see the "value" of tones accurately. The subject should be looked at broadly and simply, the object being to see *masses*, not details; half close the eyes, and the shapes and strength of the shadows and tones will define themselves clearly.

Fig. 69.



The following observations relating to shadows will be found important, as containing principles that influence their treatment under very common and frequent circumstances. They may be classed as *positive* or *decided* shadows, and *half tints*. *Decided* shadows may be divided into *broad* shadows and *cast* shadows. Broad shadows are the shadows *upon* the object. In Fig. 72, *a* is the broad shadow. Cast shadows are those which are *caused by* the object, and are thrown upon the ground, or upon some other object. In Fig. 72, *b* is the cast shadow. As a general rule, for their difference of tone or depth, the *cast* shadow is *darker* than the *broad* shadow; simply because the cast shadow being in most cases thrown upon a more extensive surface (the ground, for instance), there is then round about the cast shadow a *surface* receiving the rays of light which refracts them, or throws them back again upon the side of the object in broad shadow, and thus lowers its tone. When it occurs that no cause for refraction is present, then the broad and cast shadows are equal in tone. In Fig. 72 the rays of light coming from the direction of *f* fall upon the ground at *g g*, and are thrown back again with less power upon *a*, causing the broad shadow *a* to be lighter than the cast shadow *b*, which cannot receive the refracted rays from *g g*, being the same surface or plane upon which the light falls. Again, the *highest light* and *darkest shadow* are generally *together*; but this will be considered more fully in its place presently, when we take up the subject of *half tint.*

Fig. 70.



The pupil's first essay will be a very simple way of making a flat tone, before he attempts crossing lines; this simple method he will soon understand, and afterwards find to be an easy introduction to the crossing or *cross-hatching* system. When the surface of the shadow is large, fill it up with close perpendicular lines of *unequal* length, not permitting the ends to lap over one another, or terminate on the same level; but if the surface is small, draw

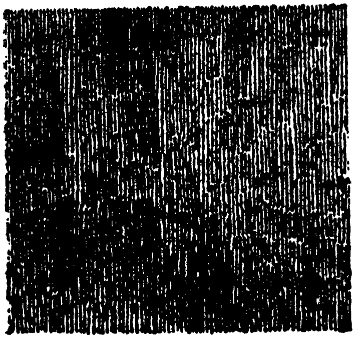


Fig. 71.

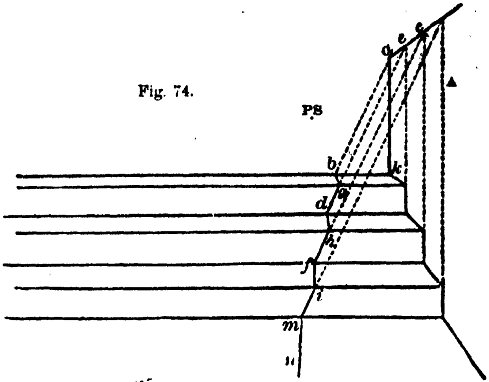


Fig. 74.

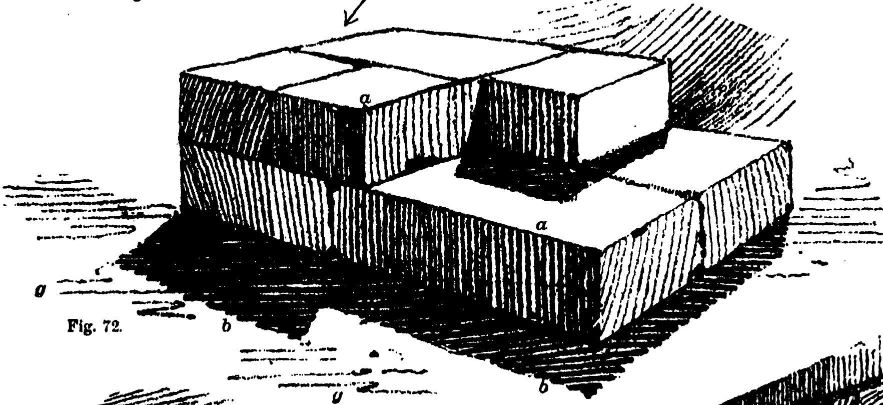


Fig. 72.

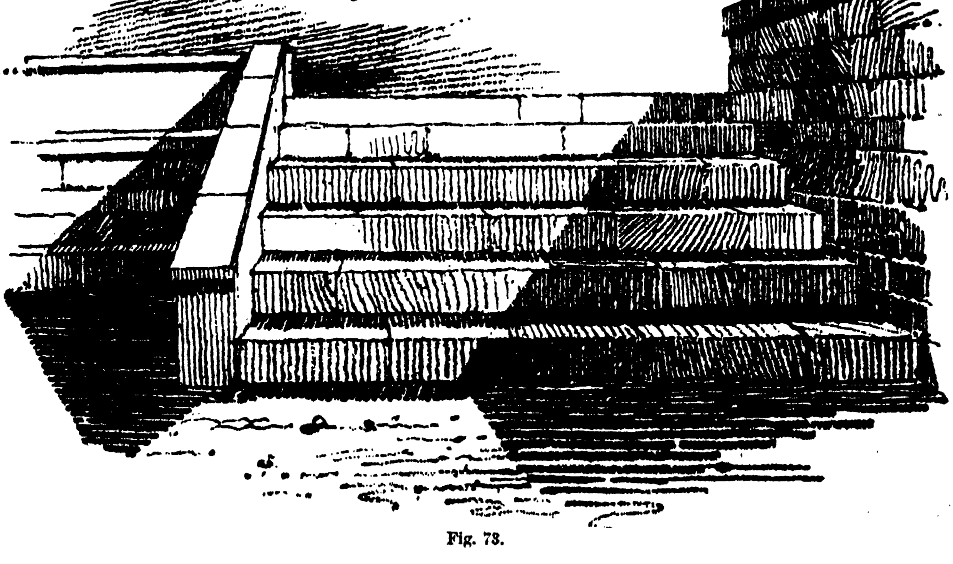


Fig. 73.

continuous lines to the full extent of the shadow, at the same time observing the tone must be regulated by the strength or pressure used in the execution. Draw the square, Fig. 71, in which is shown the method when a broad surface is to be covered by a flat tint of broken lines, as explained above. Fig. 72 is given to represent the *continuous* lines, commencing carefully and evenly from one side of the shadow, and terminating exactly at the other side; observe the tone, and consequently the amount of pressure required for the cast shadow.

There is a very useful little instrument for shading, called a *stump;* it is made either of leather or paper, rolled up to about the length and thickness of the finger, and pointed at each end. When used, black chalk or lead is ground to a powder, the point of the stump is dipped into it, and then rubbed over the part to be shaded until an even tint is produced. We merely mention the stump here and explain its use, but at present we will put it aside, and keep to the *line* method until the pupil has thoroughly mastered it; afterwards we will draw his attention to the use of the stump, as capable of producing a *ground* for shadows to be lined over afterwards. The great art of shading a drawing well is to make use of the shadows, half tints, and minor (or lighter) tones, as a means of distinguishing the form of the object, whether as to its general effect, or to the most minute and delicate details. We know that in nature objects are not represented to us by lines drawn about their edges; they are distinguishable from each other *only* by light and shade and colour: therefore, as it is necessary in the first instance to determine by *an outline* the boundary or form of the object, with all its various changes of surface, so we must as we proceed with the picture, by adding light, and shade, and colour, gradually lose the *drawn* line in the work, so as to avoid harshness, and that appearance which would strike us as if it had been cut out with a penknife. Of course we cannot altogether do without the *line* of the form, nor is it desirable that we should; and since our intention is to give as intelligible a representation of the object as we can, lines may be judiciously left without offending the eye by any unseemly harshness of expression.

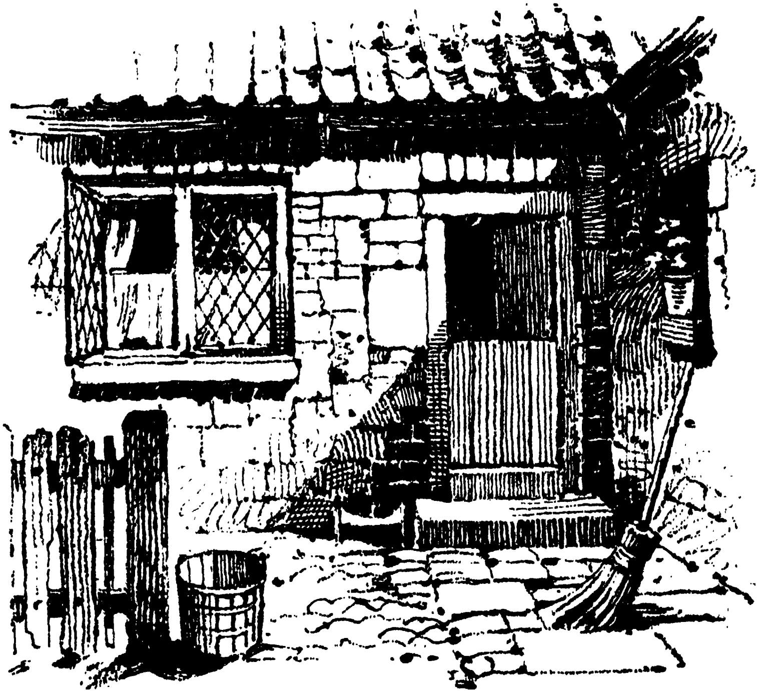


Fig. 75.

A line only determines the boundary of an object, that is to say, it gives the *form;* and in simple outline only, where no light and shade are added, our admiration is excited by the correctness and beauty of the form which the line alone determines: now this feeling must be carried on, when introducing the shadows and the infinite number of minor tones, by preserving all that the line intended to give, whilst our attention is engrossed upon the shadows.

The depth or intensity of shadows may not only be increased or diminished according to the pressure of the pencil employed, but also by the distance the lines are drawn apart—closer together when depth is required, and wider when the shadows are to be lighter. The lines which produce the cast shadow of the wall on the horizontal surface of the steps must be *drawn towards the vanishing point* of the steps, and the *edge* of the shadow is determined by the following rule:—Let A (Fig. 74) be the wall causing the shadow on the steps; let the dotted lines *a b*, *c d*, *e f*, etc., represent the inclination of the sun's rays (at an angle with the horizon, but parallel with the picture plane). As the end of the wall rises perpendicularly from the end of the step at *k*, therefore the shadow of the upper edge *a* will be at *b*, and the shadow of *a c* will be *b g*, directed towards the vanishing point of the wall; and because the sun's rays are parallel with the picture plane, and the wall at right angles with the picture plane, therefore its shadow will be the same, and consequently both the edge of the wall and its shadow have the same vanishing point, which in this case is the PS. Thus it will be seen that the edge of the shadow on the *front* of the steps is according to the inclination of the sun's rays, whilst the edge on the *top* or *tread* of the steps is directed towards the PS; therefore the upper edge of the wall casts its shadow on the line *b g*, *d h*, *f i*, *m n*.

In Fig. 75 the pupil will find a useful example for practice in shading. In copying this he must determine the extent of the shadows and the depth of their tints by the directions that have been given above.

It should also be remembered that to preserve the broad effect of the whole the pupil must not draw the numerous lines needed for the shading of this Fig. with a nervous uncertain touch, or the result will be a confused network, with little or no meaning. As well as paying great attention to the various depths of tone, the several degrees of thickness in the lines must be noted.

You will notice, too, the different directions taken by the lines in the shading, and upon examination it will be seen that this is so in order to emphasize the different materials of which the various forms represented are composed; if all the shading were exactly alike it would often be impossible to tell what was brick, or stone, or wood, etc.

HUMAN PHYSIOLOGY.—VII.

[*Continued from Vol. I., p. 337.*]

THE CIRCULATION.

HAVING in the last paper traced the products of digestion into the blood-circulation of the body, we have now to consider, under the present heading, the ultimate purpose those products serve in building up and renewing the various parts of that structure. To do this we must try and understand what is meant by the term "circulation." On examining this function we find that there are three parts necessary for us to consider; first, the circulating fluid (the blood); secondly, the circulatory apparatus (the heart and blood-vessels); and, lastly, the act itself.

Taking them in this order, we must first examine into the nature and composition of the blood. We are told, on scriptural authority, that "the blood is the life," and the important duties it fulfils in the animal economy almost entitle it to that appellation, for it is the medium by which all the nutriment is supplied to the body, and from it are built up all the various and different parts of which that body is composed. From the blood is formed alike the solid bone and the liquid milk, the hard horny structure of the nail, and the soft yielding flesh and fat; without its presence the heart would cease to beat, the eye to see, the ear to hear, or the brain to think and will. Very slight alteration in one of its many constituents is sufficient at once to disturb the balance of health, or even to destroy life itself.

Whenever blood can be examined flowing in the vessels of a living animal, as in the web of a frog's foot, the tails of some fish, or the wing of a bat, which are all sufficiently transparent to allow the process to be observed, it appears to be a colourless fluid, in which are floating a quantity of two kinds of cells, or corpuscles, some of which are white, but a much larger number red. When, however, the blood is drawn from the body it presents a very different appearance. If coming from an artery, it is a thickish fluid, of a bright scarlet colour; when from a vein, the colour is dark purple. As compared with water, the blood is considerably heavier, the ordinary specific gravity of its fluid or serum—water being taken as 1,000—varies from 1,025 to 1,030. The ordinary temperature of the blood in health is about 98·5 degrees Fahrenheit, and this is pretty uniform throughout the body, though the blood in the left side of the heart, or that which has first passed through the lungs, is one or two degrees higher than that in the right. The influence of disease is very strongly manifested in its power to diminish or increase the normal temperature of the blood. Thus in some fevers it rises to 104 or even 108, and in some exhausting diseases falls to 86, or even lower. The blood is always alkaline in its reaction, and when exposed to the air gives off a watery vapour, which is said to have an odour strongly resembling the smell of the breath or skin of the animal, so that it is possible by it to distinguish from what particular animal it is derived. The milky smell of the cow, and the strong smell of the cat, are very well defined.

As to the quantity of blood contained in the body considerable disagreement still exists, the most generally received opinion being that it forms about one-fourteenth of the weight of the whole body.

It has been said that the blood in the living vessels appears to be a clear fluid holding in suspension a number of two kinds of solid bodies. The liquid is known by the name of the *serum*, *plasma*, or *liquor sanguinis*, and the solid bodies are called respectively the *white and red corpuscles* of the blood. When blood is exposed to the action of the air certain changes take place which constitute a rough analysis of it, and reveal the presence of another and most important constituent. About ten minutes after blood has been drawn from the body, if left at rest, it changes into a kind of semi-solid or jelly. This is due to a substance contained in the serum, which continues fluid so long as the blood is in contact with the living tissues, but spontaneously coagulates when removed from their influence. This substance is called fibrin, and is a modification of albumen; the chemical composition of each being almost identical. Some time after this jelly or clot has been formed, if left exposed to the air and at rest, it contracts and squeezes out a clear yellowish fluid, in which it eventually floats. The fluid is the serum of the blood; the clot is formed of the two kinds of corpuscles, entangled by the coagulating fibrin.

What this process of coagulation signifies has been much debated, and directly opposite opinions have been held by eminent physiologists. For whilst on the one hand it was considered to be a process of life—an upward step towards a higher organisation—on the other, it was believed to be a sign of death of the structure, the effect of its removal from the living tissues. The grounds upon which the first opinion was based were mainly that in the clot formed by the coagulating fibrin distinct traces of structure were apparent, very much resembling those seen in the process of reparation which takes place in the living body when a wounded part is healing; whilst in albumen coagulated by heat or chemical agency no evidence of such change is ever observed. The latter opinion is the one most generally held, as it is universally found that in any case where vital energy is deficient the blood has a greater tendency to coagulate. Thus, when blood-letting was extensively used in medical practice, it was noticed that the blood last drawn coagulated in a less time than that which was obtained by the first bleeding.

The red corpuscles of human blood are circular bi-concave discs, composed of a delicate colourless membrane enclosing a coloured substance (*hæmoglobin*), which appears to be uniform in composition, having no nucleus. In size they average about $\frac{1}{3000}$ of an inch in diameter. Their proportion to the white ones seems to vary according to the degree of the organisation of the animal. Thus, in man the average proportion is 500 red to 1 white corpuscle. Those of the class Mammalia differ from those of the fish and bird in having no nuclei, and also in shape, the latter being, as a rule, oval or elliptical. The camels, among quadrupeds, however, have elliptical-shaped red blood corpuscles. The mammals also differ in some degree in size from each other; and upon these differences it has occasionally been attempted to base a judgment as to the particular animal from which the blood was derived. But though by the aid of the microscope it is possible to say with some certainty as to whether the blood is that of a mammal, or that of a bird, fish, frog, or reptile, this appears to be the limit; the differences in the size of the corpuscles are neither sufficiently great nor constant to decide positively whether they are those of a man, a pig, or a cow.

The white corpuscle is larger than the red, being about $\frac{1}{2500}$ of an inch in diameter, and globular in shape. They consist of masses of protoplasm, and each contains one or more nuclei. The red corpuscles are regarded as being derived from the free nuclei of the white ones. The serum of the blood—the liquid which remains after the coagulation of the fibrin—is an alkaline, slimy, viscid fluid of a yellowish or greenish colour. It consists of a large number of substances dissolved in water; its largest solid constituent is albumen, which is present to the extent of about 8 per cent. The presence of this element may be made manifest by heating the serum, when the albumen coagulates into a solid mass.

Such, then, being the principal parts of the blood, we must now examine a little its chemical composition. For this purpose two tables are given, the first showing in slight detail the various chemical substances found in the blood, and the other the proportion of its ultimate elements. Blood is thus shown in one sense to be a fluid epitome of the entire body.

TABLE I.

SHOWING THE PROPORTIONS OF THE PRINCIPAL CONSTITUENTS IN A THOUSAND PARTS OF BLOOD.

Water	784·0
Albumen	70·0
Fibrin	2·2
Red Corpuscles	130·0
Fatty Matter or Serum	1·4
Inorganic Salts or Serum	6·0
Extractive Matters, Biliary Colouring Matters, Gases, etc	6·4
	1,000

TABLE II.

SHOWING THE ULTIMATE ELEMENTS OF DRIED BLOOD.

Carbon	57·9	per cent.
Hydrogen	7·1	„
Nitrogen	17·4	„
Oxygen	19·2	„
Ashes	4·4	„

In the serum is contained a great part of the minerals, the albumen, and the water of the blood. The proportion of the latter element varies, and is influenced by many causes. Thus all active exercises which produce perspiration diminish the quantity of the water in the blood; but as they at the same time create thirst, a larger quantity of liquid is taken, and so the balance is restored. Water is truly one of the most important elements, because upon its presence in proper proportions depends the maintenance of the due viscidity of the blood, and the power to absorb the nutritive elements from the digested food. The colour of the blood resides in the red corpuscles alone, the serum being colourless. The substance *hæmoglobin* is the colouring matter of the blood, which, in turn, consists of *hæmatin* and *globulin*. The former is the true colouring matter, the latter being a nitrogenous substance. Hæmatin contains 4 parts of iron per 1,000. The colouring matter readily unites with oxygen, and the changes in the colour of the blood are due to the action of this gas and of carbonic acid gas upon it. The fatty matters of the blood vary much in quantity, being increased soon after a meal is taken, if it contains fatty, starchy, or saccharine substances.

As has been already stated, the sources from which the blood is renewed are the chyle and lymph, which are poured into the circulation by the thoracic duct. The lymph and chyle corpuscles are probably identical with the white corpuscles of the blood. The fibrin makes its appearance in the chyle almost coincidently with the corpuscles, but does not appear to have its full power of coagulating till it reaches the completed blood. We pass on now to consider the second division of this function of circulation, the organs by which it is carried out; these are the heart and the blood-vessels, consisting of arteries, capillaries, and veins.

The heart is a hollow muscle of a conical form, placed between the two lungs, and enclosed in the *pericardium* or heart-sac. Its position in the chest is oblique; its broad end or base, which is placed highest in the chest, is directed upwards and backwards to the right; the point or apex is directed forwards and to the left side. The heart is placed between the lower two-thirds of the sternum or breast-bone, and projects more to the left than it does to the right, extending about three inches from the median line in the former direction, and only an inch and a half in the latter. Anteriorly, it is rounded and convex, whilst its posterior surface is flattened, and rests on the diaphragm. Its ordinary size in the adult is about five inches in length, three inches and a half in breadth at its broadest part, and two inches and a half in thickness. Its weight is from ten to twelve ounces in men, and from eight to ten in women. It continues to increase in size up to an advanced period in life.

The pericardium in which the heart is enclosed is one of the serous membranes, and is consequently a closed sac consisting of two layers, between which is a small quantity of fluid, to enable the surfaces to glide easily over each other. When the heart is laid open, it is seen that it is composed of two sides (right and left), each divided into two chambers (Fig. 20). It is divided into two sides by a longitudinal muscular septum which runs the whole length of the organ, so that the right set is completely cut off from the left. The upper pair of these cavities are called the *auricles;* the lower pair the *ventricles.* The auricles, which are much smaller than the ventricles, are the chambers which receive the blood. Each auricle opens below into the ventricle of its side. Into the right auricle open the large veins which bring the used blood back to the heart from all parts of the body. Into the left open the *pulmonary veins*, which convey the pure blood after it has passed through the lungs. The ventricles are the chambers which by their contraction drive the blood out. The right ventricle sends the blood which it receives from the right auricle into the pulmonary artery, to be by it conveyed to the lungs, and there exposed to the action of the air. The left ventricle propels the aërated blood (sent from the lungs into it by its auricle) into the great main artery, the *aorta*, to be distributed to all parts of the body. The inside of the heart is, like the outside, covered by a serous membrane—in this instance called the *endocardium*, which by its thin smooth transparency gives to the inside of the heart its glistening appearance. This membrane, at the various apertures in the different cavities of the heart, is arranged in folds, which, with the addition of some muscular fibres and fibrous tissues, compose the valves which protect these openings. From the inner surface of the walls of the heart jut out irregular pillars of muscular fibre, many of which stand out like columns or pillars, and are thence called *columnæ carneæ* (fleshy columns). From the free extremities of these, cords run to the under-surface of the valves or flaps, and act as check-strings, preventing the valves being forced too far backwards by the pressure of the blood.

Into the right auricle, as has been said, the used blood is emptied by two large veins named respectively the *superior* and *inferior vena cava.* It is rather larger than the left auricle, and is situated at the base of the right ventricle, forming a part of the anterior surface of the heart. It communicates with its ventricle by a large oval aperture, which is protected on the ventricular side by one of the valves before mentioned, called, on account of its being composed of three segments or cusps, the *tricuspid valve.* The spot where the *inferior vena cava* enters is also protected by a valve. The right ventricle is triangular in form, and forms the greater part of the anterior surface of the heart. It has opening into it the pulmonary artery, which is guarded by a pocket-like set of three valves, called from their shape the *semi-lunar.*

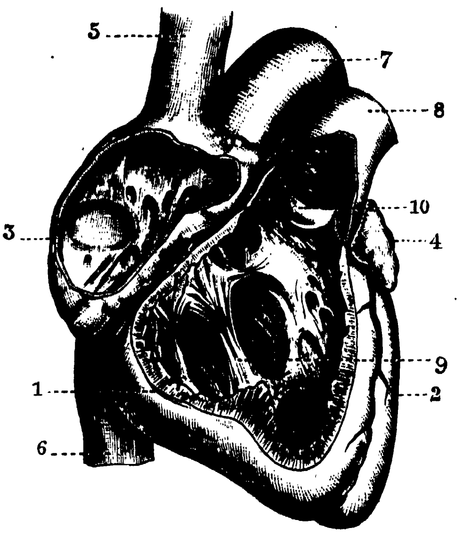


Fig. 20.—Section of Human Heart (Right Side).

1, Right Ventricle; 2, Left Ventricle; 3, Right Auricle; 4, Part of Left Auricle; 5, Superior Vena Cava; 6, Inferior Vena Cava; 7, Aorta; 8, Pulmonary Artery; 9, Muscular Columns and Tendinous Cords (attached to the Tricuspid Valve): 10, Semilunar Valves.

The left auricle is much thicker but rather smaller than the right. It receives the pulmonary veins, which are four in number, and communicates, by an opening similar to the one on the right side, with the left ventricle. The left ventricle is conical in shape, is longer, and its walls are much stronger than those of the right. It forms the posterior surface, and in consequence of its greater length the apex of the heart. The opening into it from the auricle is guarded by the *mitral valve,* which consists of two segments or flaps, but is larger, thicker, and stronger than the one on the opposite side. From the upper and back part of it springs the great main trunk, the *aorta,* the large vessel or main artery which conveys the blood for the use of the whole body. The heart, in common with all other organs that have important duties to fulfil, has special vessels to supply it with nutritive blood; these are called the *coronary arteries,* and are nearly the first branches given off from the aorta. It also is abundantly supplied with nerves, which it derives mainly, though not entirely, from the sympathetic system. Thus the heart possesses special *ganglia* or nerve masses, which direct its ordinary movements. It is also governed in part by the *vagus* nerve, which slows its action, while it is quickened or accelerated by a nerve derived from the *sympathetic* system. The valves of the heart act as follows:—The tricuspid and mitral valves existing in the form of flaps fall back, to allow the blood to pass freely from each auricle into the corresponding ventricle. Floated up by the blood, they rise in the ventricle, the edges of the flaps meeting accurately, and thus form a temporary but efficient barrier to the backward flow (into the auricle) of the blood. As each ventricle empties, its valve-flaps once more fall back, and the blood again rushes downwards from the auricle. The semi-lunar valves are placed in the ventricles, at the entrance of the great blood-vessels, which leave them for the lungs and body respectively. Each semi-lunar valve consists of three pockets, placed in a circle, so as to guard the entrance to the vessel. The mouths of the pockets are placed so as to open from the heart into the vessel. Blood can, therefore, pass readily from the ventricle; but if it attempts to return into that cavity, the pockets at once fill, and, becoming distended, with their edges meeting accurately, form a perfect obstacle to the regurgitation or back-flow of the blood.

Such, then, being the engine by which the blood is put in motion, we must now consider the channels through which it travels. The blood-vessels are divided into three sets: the *arteries,* which are the vessels carrying the blood from the heart; the *veins*, which return the blood to the heart; and an intermediate set, the *capillaries*, which form the connection between the arteries and the veins. The arteries are cylindrical tubular vessels, owing their name to an ancient opinion, which was based on the fact that they are found empty after death, and were consequently supposed to contain air (ἀήρ, *aēr*, air; τήρειν, *tērein*, to hold). They have three coats; the external, called also the elastic, is a membrane of great strength and elasticity. The middle or muscular coat is thick, composed of several layers of muscular and elastic tissue, which form a firm, solid, but rather brittle membrane. The internal, or serous, is a thin, nearly transparent membrane, moistened, as its name implies, by a serous fluid. The effect of these differences in the constitution of the coats of arteries is manifested when an artery is cut off by a ligature as in surgical operations, or torn through as in an injury. In either case the external coat shows the purpose for which it is made of so great strength and elasticity. In the case of the ligature, the internal and middle coats are at once cut through, but the external coat bears the pressure, and thus enables a permanent healing of the wound and closure of the vessels to take place before it separates. Also, when a limb is torn off, the artery, in common with the other structures, is forcibly lacerated; the inner and middle coats give way at once and retract; the external coat is pulled out to a fine point before it divides. It thus shuts off the channel of the vessel, and prevents that profuse bleeding which, without this provision, would otherwise take place.

GERMAN.—VII.

[*Continued from Vol. I., p.* 858.]

POSSESSIVE PRONOUNS.

THE possessive pronouns mein, ſein, etc., as we have already seen, are rendered absolute possessives by means of the characteristic endings -er and -es.

1. The possessive pronouns are likewise converted into absolute possessives by prefixing to them the definite article, and suffixing the terminations -e or -ige, as:—Mein Hut iſt weiß, und der dein-e iſt ſchwarz, my hat is white, and thine is black; Ihr Band iſt roth, und das ſein-ige iſt blau, her ribbon is red, and his is blue. The termination -ige is the more common.

Observe that the absolute possessive mein-er* is inflected like an adjective of

THE STRONG DECLENSION; AS,

	Masculine.	*Feminine.*	*Neuter.*
N.	Mein-er,	mein-e,	mein-es, mine.
G.	Mein-es,	mein-er,	mein-es, of mine.
D.	Mein-em,	mein-er,	mein-em, to, for mine.
A.	Mein-en,	mein-e,	mein-es, mine.

Note, also, that possessive pronouns preceded by the definite article are regarded as adjectives, and are inflected as adjectives are when they follow the article; that is, according to

THE WEAK DECLENSION; AS

	Masculine.	*Feminine.*	*Neuter.*
N.	Der mein-ige,	die mein-ige,	das mein-ige, mine.
G.	Des mein-igen,	der mein-igen,	des mein-igen, of mine.
D.	Dem mein-igen,	der mein-igen,	dem mein-igen, to, for mine.
A.	Den mein-igen,	die mein-ige,	das mein-ige, mine.

ABSOLUTE POSSESSIVES AS INFLECTED IN ALL GENDERS OF THE PLURAL.

	After the Strong Declension.	*After the Weak Declension.*
N.	Mein-e,	die mein-igen, mine.
G.	Mein-er,	der mein-igen, of mine,
D.	Mein-en,	den mein-igen, to, for mine.
A.	Mein-e,	die mein-igen, mine.

2. When the *absolute* possessive pronouns do not relate to some noun previously mentioned, they refer, in the *plural*, to one's relatives or family,† and in the *neuter singular* to one's property, as:—Das Meine or das Meinige, my property; das Deine or das Deinige, thy property; das Seine or das Seinige, his property; das Ihre or das Ihrige, her property, your property, or their property. Die Meinen or die Meinigen, my family, etc.; die Deinen or die Deinigen, thy family, etc.; die Seinen or die Seinigen, his family, etc. This absolute use of the possessive pronouns is not unknown in English. Thus, in the expressions "I and mine," "you and yours," "mine" and "yours" mean "my family" and "your family" respectively.

EXAMPLES.

Weſſen Uhr hat Ihre Mutter?	Whose watch has your mother?
Sie hat die ih'rige.	She has hers (*or* her own).
Haben Sie meine Brille oder die Ihrige?	Have you my spectacles or yours?
Ich habe die mei'nige.	I have mine (*or* my own).
Je'dermann ſchätzt das Sein'ige.	Every man praises his own (property).
Liebt auch Je'dermann die Sei'nigen?	Does every man likewise love his family?

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* In the same way are treated deiner, deine, deines, thine; and ſeiner, ſeine, ſeines, his.

† They may likewise refer (when the connection makes the application evident) to dependents, as servants, soldiers, subjects, etc.

VOCABULARY.

Allmäch'tig, *adj.* almighty.
Ei'genheit, *f.* peculiarity.
Fehler, *m.* mistake, error.
General', *m.* general.
Gott, *m.* God.
Hand, *f.* hand.
Hemd, *n.* shirt.
Kutſcher, *m.* coachman.
Nehmen, to take.
Obla'te, *f.* wafer.
Schickſal, *n.* fate, destiny.
Schloſſer, *n.* locksmith.
Schlüſſel, *m.* key.
Sowohl als, as well as.
Stempel, *m.* stamp.
Waſchfrau, *f.* washerwoman.
Weltmeer, *n.* ocean.
Wieſe, *f.* meadow.
Zwiſchen, between.

EXERCISE 27.

Translate into English:—

1. Hat der Capitän ſein oder des Generals Schwert? 2. Er hat das ſeinige. 3. Haben Sie meine Scheere? 4. Nein, ich habe die meinige. 5. Wer hat meinen Stock? 6. Herr S. hat ihn. 7. Hat meine Schweſter Ihren Regenſchirm? 8. Nein, ſie hat den ihrigen. 9. Hat der Schloſſer meinen Schlüſſel? 10. Nein, er hat es nicht. 11. Hat die Waſchfrau die Hemden meines Bruders und meiner Freunde? 12. Sie hat ſowohl die ſeinigen, als die ihrigen. 13. Alle Menſchen haben ihre Fehler und Eigenheiten—ich habe die meinigen, Sie haben die Ihrigen, und er hat die ſeinigen. 14. Gott iſt allmächtig; die Schickſale des Menſchen ſind in ſeiner Hand, auch das meinige und das deinige. 15. Das Weltmeer iſt zwiſchen mir und den Meinigen. 16. Hat Herr A. Ihr Papier oder das meinige? 17. Er hat das ſeinige. 18. Mein Bruder hat mein Buch und ich habe das ſeinige. 19. Hat er Ihre Oblaten und Stempel oder die ſeinigen? 20. Er hat die meinigen. 21. Weſſen Wagen hat Ihr guter Freund, Herr G.? 22. Er hat den ſeines Oheims. 23. Und weſſen Pferde hat er? 24. Er hat die ſeinigen. 25. Weſſen Handſchuhe haben Sie? 26. Ich habe die meinigen. 27. Weſſen Schafe ſind dieſe auf der Wieſe? 28. Sie ſind die unſrigen. 29. Haben dieſe Deutſchen ihre Pferde und ihre Wagen, oder die unſrigen? 30. Sie haben die unſrigen. 31. Weſſen Bücher haben dieſe Schüler? 32. Sie haben die ihrigen. 33. Nehmen Sie immer das Ihrige? 34. Ja, Jedermann nimmt das Seine. 35. Wann haben Sie die Ihrigen geſehen? 36. Ich habe ſie vorgeſtern geſehen. 37. Haben Sie mich und die Meinigen geſtern Abend in dem Concert geſehen? 38. Ja, ich habe Sie und die Ihrigen geſehen. 39. Der Feldherr lobte die Seinigen.

EXERCISE 28.

Translate into German:—

1. The coachman of Count B. has fine horses. 2. The daughters of the infirm general are very proud. 3. I have lost my letter-stamp, but here is yours and his. 4. To whom do these beautiful meadows belong? Are they yours? 5. No, they are not mine; they are the property of my friend, Mr. K. 6. Have you his key or yours? 7. I have neither his nor my own, but that of my wife. 8. They discovered the thief by the shirt which he wore, and which was not his own. 9. When did you see your friends? 10. I have not seen them since last summer. 11. He loves his property too much. 12. Did you see me and my family last night between seven and eight o'clock in the avenue?

RELATIVE PRONOUNS.

In compound *sentences*, connected by a relative, the verb stands at the end of the last clause, as well when the relative is in the nominative as when it is in an oblique case, as:—Das Buch welches ich habe, the book which I have; Das Buch welches hier iſt, the book that here is (is here). In compound *tenses* the *main verb* immediately *precedes* the *auxiliary*, as:—Das Buch welches ich gehabt habe, the book that I had have (have had); Das Buch welches ich haben werde, the book that I have shall (shall have).

The same position of the verb is required when the second of two connected clauses is introduced by a conjunction or an adverb, as:—Ich kaufte es, weil es wohlfeil iſt, I bought it, because it is cheap; Er wohnt noch, wo er gewohnt hat, he still resides where he has resided; Er kommt, wenn er nicht krank iſt, he will come, if he is not sick (he comes, if he is not sick).

1. Derjenige (that *or* the one) always points to something specified by a relative in a succeeding clause. It is compounded of the substantive pronoun der, die, das, and jener, with the termination -ige, which we have already seen in meinige, deinige, etc. It is frequently used instead of der, die, or das, for the sake of greater emphasis, as:—Er liebt nur dasjenige (instead of das), was er achtet, he loves only that which he esteems.

Derjenige is inflected like der meinige, that is, its first component is declined like the definite article and its last like an adjective of the weak declension.

DECLENSION OF Derjenige, SINGULAR AND PLURAL.

Singular.

	Masculine.	*Feminine.*	*Neuter.*
N.	Derjenige,	diejenige,	dasjenige, that (the one).
G.	Desjenigen,	derjenigen,	desjenigen, of that.
D.	Demjenigen,	derjenigen,	demjenigen, to that.
A.	Denjenigen,	diejenige,	dasjenige, that.

Plural, all genders.

N.	Diejenigen, those.	D.	Denjenigen, to those.
G.	Derjenigen, of those.	A.	Diejenigen, those.

2. Welcher (relative) always adopts the genitive of the substantive pronoun der in the feminine singular and in the plural of all genders, and usually in the masculine and neuter singular.

DECLENSION OF THE RELATIVE Welcher.

	Singular.			*Plural.*
	Masc.	*Fem.*	*Neut.*	*All genders.*
N.	Welcher,	welche,	welches,	welche, who, which, that.
G.	Deſſen,	deren,	deſſen,	deren, whose, of whom, etc.
D.	Welchem,	welcher,	welchem,	welchen, to whom, etc.
A.	Welchen,	welche,	welches,	welche, whom, which, that.

The genitive of welcher used interrogatively is weſſen.

EXAMPLES OF Welcher (INTERROGATIVE AND RELATIVE) AND Derjenige.

Welcher Mann iſt krank?	Which man is sick?
Derjenige, welcher im Hauſe iſt.	The one who is in the house.
Welche Feder haben Sie?	Which pen have you?
Ich habe diejenige, welche Sie gehabt haben.	I have the one that you have had.
Weſſen Buch haben Sie?	Whose book have you?
Ich habe das des Mannes, deſſen Stock Sie haben.	I have that of the man whose stick you have.
Welchen Knaben haben Sie das Geld gegeben?	To which boys have you given the money?
Ich habe es denjenigen gegeben, welchen Sie Brod gaben.	I have given it to those to whom you gave bread.

The demonstrative pronoun der, die, das is sometimes used for derjenige, and the relative der, die, das for welcher: — Der Mann der krank iſt, the man that (who) is sick; Welches Buch haben Sie? which book have you? Ich habe das (dasjenige), das (welches) Sie gehabt haben, I have that (the one) that (which) you have had.

No difference is marked between the demonstrative and relative der, die, das, except in the genitive plural. In this case the demonstrative takes the form derer, the relative the form deren.

The use of derjenige often corresponds to that of our third personal pronoun, as well in the singular as in the plural, as:—Derjenige, den Sie ſuchen, iſt nicht hier, he (the one) that (whom) you seek is not here; Diejenigen, die Sie ſuchen, ſind nicht hier, they (those) whom you seek are not here.

EXAMPLES.

Wir lieben die'jenigen, die (welche) uns lieben.	We love those, who (that) love us.
Ich habe den Hut, den ich geſtern gehabt habe.	I have the hat that I (have) had yesterday.
Sie haben die Aepfel, die reif ſind, und ich habe die'jenigen, die grün ſind.	You have the apples that are ripe, and I have those that are green.
Der'jenige, den ich ſuche, iſt nicht hier.	He whom I seek is not here.
Der'jenige, deſſen Stock ich habe, iſt krank.	He whose stick I have is sick.
Die'jenige, zu der die Mutter geht, iſt krank.	She to whom the mother is going is sick.
Die'jenigen die ſtolz ſind, ſind auch närriſch.	They (or those) that are proud, are likewise foolish.

VOCABULARY.

Amtmann, *m.* magistrate.
Ar'beiter, *m.* labourer, workman.
Ein'ſiedler, *m.* hermit.
Friede, *m.* peace, tranquillity.
Herz, *n.* heart.
Hülflos, helpless.
Kapel'le, *f.* chapel.
Kaufen, to buy.
Laſ'terhaft, vicious.
Letzt, last.
Lohn, *m.* reward.
Narbe, *f.* scar.
Oheim, *m.* uncle.
Scheune, *f.* shed, barn.
Stirn, *f.* forehead.
Verlaſ'ſen, forsaken, left.
Weinberg,[*] *m.* vineyard.
Wohnhaus, *n.* dwelling.

EXERCISE 29.

Translate into English:—

1. Welches Kind liebt der Oheim? 2. Er liebt dasjenige, welches er lobt. 3. Welches Kind liebt den Oheim? 4. Dasjenige, welches er liebt, liebt ihn. 5. Welchen Hut haben Sie? 6. Ich habe denjenigen, welchen Ihr Herr Bruder geſtern gehabt hat. 7. Welchen Knaben liebt der Vater? 8. Er liebt denjenigen, welchen die Mutter lobt. 9. Welcher Knabe liebt die Mutter? 10. Derjenige, welchen der Vater lobt. 11. Welches Pferd hat Ihr Bruder gekauft? 12. Er hat dasjenige gekauft, welches Sie geſtern gehabt haben. 13. Welchen Mann loben Sie? 14. Ich lobe denjenigen deſſen Sohn Sie lieben. 15. Welche Bücher haben Sie gekauft? 16. Ich habe diejenigen gekauft, welche mein Bruder in der Schule gehabt hat. 17. Weſſen Bücher haben Sie? 18. Ich habe die Bücher derjenigen Knaben, die Sie heute geſehen haben. 19. Diejenigen, welche laſterhaft ſind, haben keinen Frieden des Herzens. 20. Derjenige, welcher die Narbe an der Stirn hat, iſt der alte Amtmann. 21. Dasjenige iſt gut, was nützlich iſt. 22. Dieſe Männer ſind dieſelben, deren Scheunen, Ställe und Wohnhäuſer Sie geſtern geſehen haben. 23. Der Einſiedler jener Kapelle iſt ein Freund derer, die hülflos und verlaſſen ſind. 24. Der iſt weiſe, der tugendhaft iſt.

EXERCISE 30.

Translate into German:—

1. The friend whom I have is faithful. 2. Whose key have you? 3. I have that of my brother, whom you know. 4. I shall give this book to that (man) who will be first here. 5. Have you seen my book? 6. No, I have not seen the one which you mention. 7. The joy which I shall have will be great. 8. I came, because I had promised it to him. (*Translate in the following order:*—"Because I it to him promised had.") 9. Where do you live? 10. I live in the same house in which I lived when you called

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[*] Literally, "Wine-mountain;" so called because most vineyards in Germany are upon hills or small mountains; the sunny sides of these being favourable to the growth of the vine.

upon me. 11. Which of these ladies is your wife? 12. The one who is talking with the old gentleman. 13. The friend whom I have lost was very dear to me. 14. I have bought that coat which you saw in my tailor's window. 15. Remember me to that gentleman who is so very polite.

THE VERB "TO BE."

Sein, like the corresponding English verb, is very irregular in conjugation, some of its parts having been derived from verbs now obsolete.

It is used as the auxiliary to form the past tense of many intransitive verbs, such as kommen, gehen, ſterben, etc., which denote either motion or a change of condition, as:—Er iſt gekommen, he is come; Er iſt gegangen, he is gone. It is also employed as the auxiliary in its own conjugation, as:—Ich bin geweſen, I have been; literally, I *am* been.

Sein, to be.

INDICATIVE MOOD.

	PRESENT.		PAST.
Sing.	Ich bin, I am.	*Sing.*	Ich war, I was.
	Du biſt.		Du warſt.
	Er iſt.		Er war.
Plur.	Wir ſind.	*Plur.*	Wir waren.
	Ihr ſeid.		Ihr waret.
	Sie ſind.		Sie waren.

	PRESENT PERFECT.		PLUPERFECT.
Sing.	Ich bin geweſen, I have been.	*Sing.*	Ich war geweſen, I had been.
	Du biſt geweſen.		Du warſt geweſen.
	Er iſt geweſen.		Er war geweſen.
Plur.	Wir ſind geweſen.	*Plur.*	Wir waren geweſen.
	Ihr ſeid geweſen.		Ihr waret geweſen.
	Sie ſind geweſen.		Sie waren geweſen.

	FUTURE IMPERFECT.		FUTURE PERFECT.
Sing.	Ich werde ſein, I shall be.	*Sing.*	Ich werde geweſen ſein, I shall have been.
	Du wirſt ſein.		Du wirſt geweſen ſein.
	Er wird ſein.		Er wird geweſen ſein.
Plur.	Wir werden ſein.	*Plur.*	Wir werden geweſen ſein.
	Ihr werdet ſein.		Ihr werdet geweſen ſein.
	Sie werden ſein.		Sie werden geweſen ſein.

EXAMPLES OF Sein AS AN AUXILIARY VERB.

Ich bin gekommen, I have come.	Wir ſind gekommen, we have come.
Du biſt gekommen, thou hast come.	Ihr ſeid gekommen, you have come.
Er iſt gekommen, he has come.	Sie ſind gekommen, they have come
Ich bin gegangen, I have gone.	Wir ſind gegangen, we have gone.
Du biſt gegangen, thou hast gone.	Ihr ſeid gegangen, you have gone.
Er iſt gegangen, he has gone.	Sie ſind gegangen, they have gone.

EXAMPLES.

Die Werke Gottes ſind man'nigfaltig; ſeine Liebe iſt unend'lich und an allen Orten ſichtbar.	The works of God are manifold; his love is infinite and in all places visible.
Ich war in der Stadt, als der König da war.	I was in the city when the king was there.
Der Kronprinz iſt vor'geſtern hier ge'weſen.	The crown-prince was here the day before yesterday.
Wer iſt mit der Schweſter auf das Land gegan'gen?	Who has gone to the country with your (the) sister?
Dieſel'be, die vor'geſtern mit ihr hierher' gekom'men iſt.	The same that came here (hither) with her the day before yesterday.
Gehen Sie heute auf das Land?	Do you go to the country to-day?
Nein, weil ich ſo e'ben von dem Lande gekom'men bin.	No, for I have just come from the country.

VOCABULARY.

Berlin', *n.* Berlin.
Bleiben, to remain.
Bringen, to bring.
Da, there.
Dresden, *n.* Dresden.
Fliegen, to fly.
Friedrich, *m.* Frederick.
Glauben, to believe.
Jemand, somebody, anybody.
Käfig, *m.* cage.
Kennen, to know, to be acquainted with.
Kommen, to come.
Laufen, to run.
Markt, *m.* market.
Nachricht, *f.* news.
Preußen, *n.* Prussia.
Rindfleiſch, *n.* beef.
Schnee, *m.* snow.
Schreiben, to write.
Sprechen, to speak.
Vogel, *m.* bird.
Wetter, *n.* weather.
Wien, *n.* Vienna.
Wiſſen, to know.
Wohnen, to reside, to dwell.

EXERCISE 31.

Translate into English:—

1. Iſt dieſer junge Mann krank? 2. Nein, aber er iſt geſtern krank geweſen. 3. Wer iſt in dem Garten Ihres Vaters geweſen? 4. Niemand iſt in dem Garten geweſen, aber Jemand iſt in ſeinem Hauſe geweſen. 5. Wie lange bleibt der alte Bauer noch in der Stadt? 6. Ich kenne den alten Bauern nicht, und weiß nicht, wie lange er bleibt. 7. Iſt Ihr alter Freund, der Kaufmann, nach Wien gegangen? 8. Ich glaube, er iſt nach Berlin zu ſeinem Bruder gegangen. 9. Von wem haben Sie heute dieſe Nachricht gehört? 10. Ich habe einen meiner Freunde geſprochen, welcher von Dresden gekommen iſt, und mir einen Brief von meinem Vater gebracht hat. 11. Ich wohne bei meinem Oheim, und gehe mit ihm nach dem kleinen Dorfe. 12. Mein ſchöner Vogel iſt aus dem Käfig geflogen und mein kleines Pferd iſt nach dem Walde gelaufen. 13. Was hat Ihr Herr Vater Ihnen geſchrieben? 14. Er hat mir einen langen Brief geſchrieben. 15. Wann

ſind Sie auf dem Markte geweſen? 16. Ich bin vorgeſtern Abend da geweſen, und habe Rindfleiſch gekauft. 17. Wir haben dieſen Nachmittag ſchönes Wetter gehabt. 18. Dieſe Schüler ſind faul und jene fleißig geweſen. 19. Der Schnee iſt vorgeſtern ſehr tief geweſen. 20. Ich bin nie krank geweſen. 21. Friedrich der Große war ein König von Preußen.

EXERCISE 32.

Translate into German :—

1. Is your sister who gave me these flowers at home? 2. No, she has gone into the country. 3. There has been somebody in the garden. 4. Do you reside in Berlin? 5. No, I reside in Dresden. 6. The Queen has returned from Belgium. 7. Do you know the merchant who came from Vienna? 8 Yes, I know him. 9. You have had little pleasure on your journey; you have not been far. 10. You had more pleasure than we had, but we have been as much pleased as you.

KEY TO EXERCISES.

Ex. 21.—1. I love the neighbour's child. 2. The father has sent this letter to me. 3. I shall warn the friend. 4. I have watched the whole night by the sick brother. 5. The huntsmen were hunting yesterday morning in the forest, and will hunt this afternoon in the vicinity of the village. 6. My friend loved fame and glitter. 7. He has plucked a rose, and presented it to his friend (f.). 8. A clever mason of this city has built this beautiful house. 9. Napoleon esteemed the brave soldier, and not the squire and nobleman. 10. The labours of my youth have strengthened my body. 11. Conscience warns people from sin.

Ex. 22.—1. Der Lehrer ſchenkte dem Schüler ein ſchönes Buch. 2. Sie hatte ihre Freundin getäuſcht. 3. Die Kinder werden den alten Vater gekränkt haben. 4. Ein ungerathenes Kind kränkt den Vater und die Mutter. 5. Ich habe deine Stimme in dem Zimmer gehört. 6. Er wird den Boten geprüft haben, ehe er ihn zu dem Freunde ſchickte. 7. Der Bauer hat ſein Haus mit Stroh gedeckt. 8. Dieſes Unglück wird ihn gelehrt haben vorſichtig zu ſein. 9. Ich habe viele Fiſche in dem Fluſſe geſehen. 10. Ein kalter Trunk im Sommer ſtärkt den Körper, wie der Thau das welke Gras des Feldes. 11. Der Schmerz liebt den Mond als einen Tröſter, die Einſamkeit liebt ihn als einen Begleiter, und die Frömmigkeit als den Aufenthalt einer reinen Seele.

Ex. 23.—1. What has your brother? 2. He has new books. 3. Why have you had my white gloves to-day? 4. I had them yesterday, but to-day I have not had them. 5. We shall have an agreeable day to-morrow. 6. My father will have had my letter before his departure. 7. This poor man went to my uncle the day before yesterday. 8. He gave him two handkerchiefs and a new hat. 9. Do you often see my brother, and do you sometimes speak to him? 10. I saw him yesterday, but I have not spoken to him. 11. Did you sing this morning, or did your daughter sing? 12. I have sung in my youth, but now I sing no more. 13. Have you my new German grammar? 14. No, not now, but I had it yesterday. 15. No one is happy but the contented man, and no one is wise but only the pious. 16. Has your wife written a letter to your cousin? 17. No, not yet, but she will write to him to-morrow. 18. Cæsar wrote to Rome, "I came, saw, and conquered." 19. I gave this poor man my old shoes.

Ex. 24.—1. Haben Sie meinen Bruder geſehen? 2. Nein, ich habe ihn nicht geſehen, aber meine Frau hat ihn vorgeſtern geſehen. 3. Er ſchrieb einen langen Brief, und ſprach nicht ein Wort. 4. Meine Mutter hat mir ein neues Kleid und ein ſchönes Taſchentuch gegeben. 5. Glauben Sie, daß wir morgen ſchönes Wetter haben werden? 6. Ich glaube, es wird regnen.

Ex. 25.—1. Which hat have you? 2. I have that of my brother. 3. Which paper have you? 4. I have that of my friend, the teacher. 5. Which of these boys has his books? 6. I have your blue ink, and your beautiful pink-coloured paper. 7. Which of them has my pencil? 8. Henry, your little cousin, has your wooden pencil. 9. Which of my books is in your room? 10. Your Gellert's Fables are there. 11. Which of these two little boys is your nephew? 12. They are both my cousins. 13. Are they brothers? 14. Yes, they are twins. 15. Which of your American friends are at the council-house? 16. Mr. C. and Mr. L. 17. Whose book have you? 18. I have that of your cousin. 19. When did your father have my letter? 20. He had it the day before yesterday, and his friend, the painter, had that of his mother yesterday. 21. Has the teacher praised your son or your nephew? 22. He has praised neither my son nor my nephew. 23. Have you Henry's pens, or those of Adolphus? 24. I have neither those of Henry nor those of Adolphus. 25. Who praises the old captain? 26. The captain praises him? 27. He praises the whole nation.

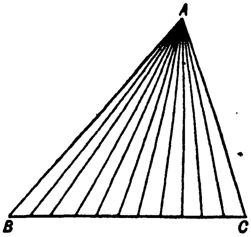
Ex. 26.—1. Welchen Regenſchirm haben Sie? 2. Ich habe den meines Bruders, des Bildhauers. 3. Wann kauften Sie dieſes roſenfarbene Kleid? 4. Ich kaufte es geſtern von meinem Vetter, dem Tuchhändler. 5. Wollen Sie dieſes Buch dieſem oder jenem Manne geben? 6. Ich will es keinem geben.

GEOMETRY.—VII.

[Continued from Vol. I., p. 375.]

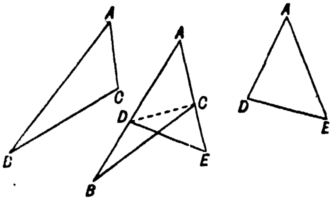
RATIO AND PROPORTION APPLIED TO AREAS.

IF the base B C of a triangle A B C be divided into a great number of very small equal parts, and straight lines be drawn from the vertex A to the points of section, the same number of extremely narrow triangles will be formed, and these will all be of equal area, because they stand on equal bases and have the same altitude. It is obvious that for every little length in the base we have a corresponding small triangular space in the area, and that for every little length we may add to the base, we add by completing the figure a corresponding little triangular surface to the area. In other words, the area is increased or

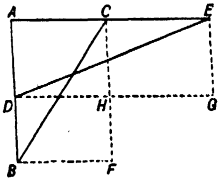


decreased proportionally to any increase or decrease given to the base. As long as the altitude remains unaltered, doubling the base means doubling the area, trebling the base trebling the area, and so on.

When four straight lines are proportionals, if a triangle be formed having the two extremes for sides and any angle whatever for vertical angle or angle contained by these sides, and another triangle be formed having the two means for sides and an angle of the same magnitude for vertical angle, then the two triangles are equal in area. Of the four terms in the proportion AB:AD::AE:AC, the extremes AB and AC are used to form sides of a triangle ABC, having any vertical angle BAC, and the means AD and AE to form sides of another triangle having a vertical angle DAE of the same magnitude as BAC. One triangle is now placed on the other, so that the vertical angles coincide in the angle DAC, and DC is joined. The area CAB and the area DAE are equal, because they bear an equal ratio to the area ADC, the one ratio being that of AB:AD, and the other that of AE:AC, and these two ratios are given equal. A pair of triangles or parallelograms, having two sides of the one proportional to two sides of the other, so that a side of the first figure is to a side of the second as the other side of the second is to the other side of the first, are said to have sides in *reciprocal proportion.*

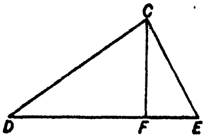


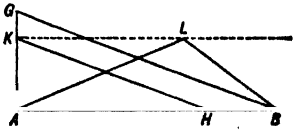
A particular case of great mathematical value presents itself when the vertical angle common to the two triangles is a right angle. Complete the rectangles ACFB and AEGD, which are the doubles of the equal triangles, and therefore themselves equal, *i.e.*, the rectangle contained by AB and AC, the extremes of the proportion, is equal to the rectangle contained by AD and AE, the means.



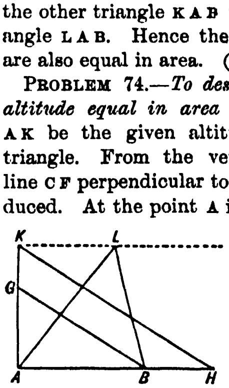
PROBLEM 73.—*On a given base to describe a triangle equal in area to a given triangle.* Let AB be the given base and CDE the given triangle. From the vertex C draw the straight line CF perpendicular to the base DE, or base produced. At the point A draw a perpendicular to AB, and cut off AG equal to CF. From AB cut off AH equal to DE. Join BG, and draw HK parallel to it. Any triangle on AB, having its vertex in the straight line through K parallel to AB, as, for example, the triangle LAB, is the triangle required.

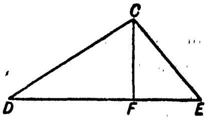
Because AB : AG : : AH : AK, the triangle AGH (formed by joining GH) is equal in area to the triangle AKB (formed by joining KB), having the same vertical angle at A. But the one triangle AGH is equal in area to the triangle CDE, having equal base and altitude, and for a similar reason the other triangle KAB is equal in area to the triangle LAB. Hence the triangles CDE and LAB are also equal in area. (*See* Problem 30.)



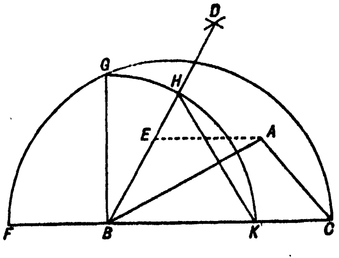


PROBLEM 74.—*To describe a triangle of given altitude equal in area to a given triangle.* Let AK be the given altitude and CDE the given triangle. From the vertex C draw the straight line CF perpendicular to the base DE, or base produced. At the point A in AK draw a straight line at right angles to KA, and cut off AH equal to DE. From AK cut off AG equal to CF. Join KH, and draw GB parallel to it. Any triangle on AB having its vertex on the straight line through K parallel to AB, as, for example, the triangle LAB, is the triangle required.





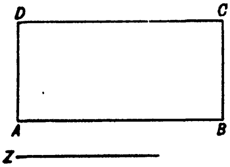
PROBLEM 75.—*To describe an equilateral triangle equal in area to any given triangle.* Let ABC be the given triangle. About the points B and C as centres, with the radius BC, describe arcs of circles, intersecting in the point D. Join BD, forming the angle DBC, the angle of an equilateral triangle DBC. Let BD or BD produced meet the straight



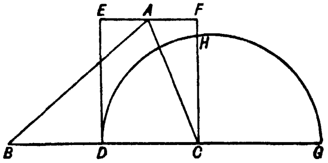
line drawn through A parallel to the base BC in the point E. From CB produced cut off, from the produced portion, BF equal to BE; on FC describe a semicircle FGC, and in it draw the perpendicular BG, the mean proportional between BF and BC, as shown in Problem 60. About the centre B, with the radius BG, describe an arc of a circle, cutting BD or BD produced in H, and BC or BC produced in K. Join HK, forming the triangle HBK, the equilateral triangle required.

Supposing EC joined, we have the triangle ABC equal in area to the triangle EBC. Again the triangles HBK and EBC are equal in area, because they contain the same vertical angle EBK, and their sides about this angle are reciprocally proportional.

PROBLEM 76.—*On a given straight line to describe a rectangle equal in area to a square whose side is given.* Let AB be the given straight line and Z the given side of a square. At A in AB draw a perpendicular, AD, a third proportional to AB and Z (Problem 59). Complete the rectangle ABCD, which is the rectangle required.

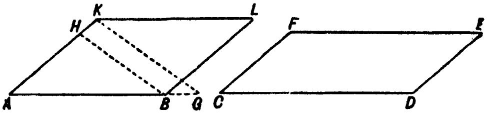


PROBLEM 77.—*To describe a square equal in area to a given triangle.* Let ABC be the given triangle. Bisect the base BC in D. On the half base CD describe a rectangle CDEF, with the opposite side EF passing through the vertex A of the triangle. Produce BC, and from the part produced cut off CG equal to CF. On DG describe a semicircle, cutting CF or CF produced in H. The square described on CH is the square required.

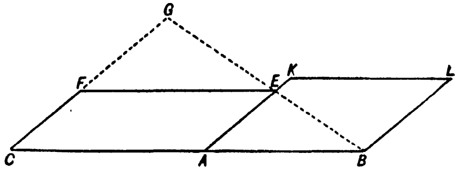


CH is a mean proportional of the two sides DC and CF, containing the rectangle CDEF, which is equal in area to the given triangle. Hence, any two sides containing the square and any two containing the rectangle are reciprocal proportionals, and the areas are therefore equal. (*See* Problem 50, in which the essential portion of this problem is reasoned out on a different principle—the principle of equal areas instead of proportionality of sides.)

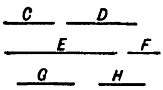
PROBLEM 78. — *On a given straight line to describe a parallelogram equiangular and equal in area to a given parallelogram.* Let AB be the given straight line and CDEF the given parallelogram. From AB, or AB produced, cut off AG equal to CD. At A in AB make an angle equal to the angle at C, and from its new side cut off AH equal to CF. Join BH, and draw a parallel to it from G, meeting AH, or AH produced, in K. Complete the parallelogram ABLK, which is the parallelogram required.

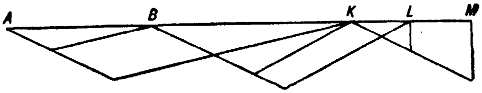


Second method.—Produce BA to a point C, so that CA is equal to CD. On CA reproduce the given parallelogram. Join BE, and produce it to meet CF produced at the point G. On AE, or AE produced, cut off AK equal to FG. Complete the parallelogram ABLK, which is the parallelogram required.



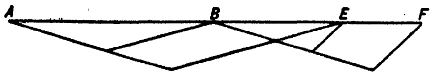
PROBLEM 79.—*To find a straight line which shall bear to a given straight line a ratio compounded of two or more given ratios.* Let AB be the given straight line, and the ratios of C : D, E : F, and G : H three given ratios. To C, D, and AB find a fourth proportional BK; to E, F, and BK a fourth proportional KL; and to G, H, and KL a fourth proportional LM. Then AB : LM is the ratio compounded of the three ratios AB : BK, BK : KL, and KL : LM, *i.e.*, of the three given ratios C : D, E : F, and G : H, as required by the question. (For construction, *see* Problem 58.)





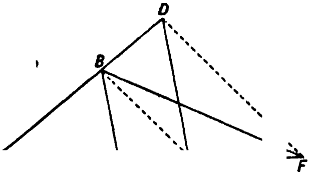
A more compact figure, though somewhat confused, is obtained by cutting off the lengths C and D from the subsidiary line, both from the point A, instead of one in continuation of the other, E and F and G and H being cut off similarly.

PROBLEM 80.—*To find a straight line which shall be to a given straight line in the duplicate ratio of two given lengths.* Let AB be the given straight line and C and D the given lengths. To C, D, and

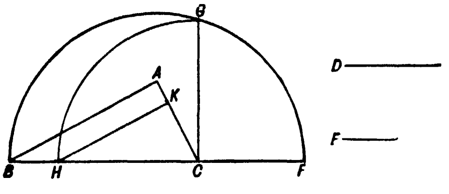


AB find a fourth proportional BE, and to C, D and BE, a fourth proportional EF. Then AB : EF is the ratio compounded of AB : BE and BE : EF, *i.e.*, of the ratio C : D repeated. Hence AB : EF in the duplicate ratio of C : D, as required by the problem.

The areas of two similar triangles are to each other in the duplicate ratio of corresponding sides. Let ABC and ADE be two similar triangles, placed so as to have their angles at A coincident. Being similar triangles, BC is parallel to DE. Join BE, and draw DF parallel to BE, meeting AE produced in F. Then the ratios of AC : AE and AE : AF are both equal to the ratio of AB : AD, and, therefore, equal one to another. Hence the two together, *i.e.*, AC : AF, form the duplicate ratio of AC : AE. Now the area DAE is equal to the area BAF, these two triangles having a common vertical angle and the sides about this angle reciprocally proportional. Hence area BAC : area BAF : : base AC : base AF—*i.e.*, in the duplicate ratio of AC : AE, or the duplicate ratio of corresponding sides of the two given triangles.

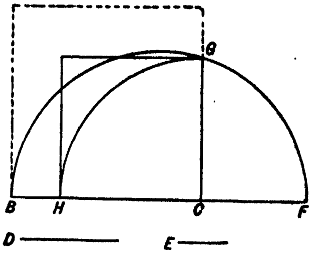


PROBLEM 81.—*To describe a triangle similar to a given triangle, so that their areas may be in a given ratio.* Let ABC be the given triangle and the ratio of D : E the given ratio. Produce BC, and on the produced portion take CF a fourth proportional to D, E, and BC. Find CG, the mean proportional between BC and CF. About C as centre, with radius CG, describe an arc of a circle meeting BC (or BC produced) in H. On HC describe a triangle by drawing a side parallel to BA, meeting CA (or CA produced) in K. KHC is the triangle required.



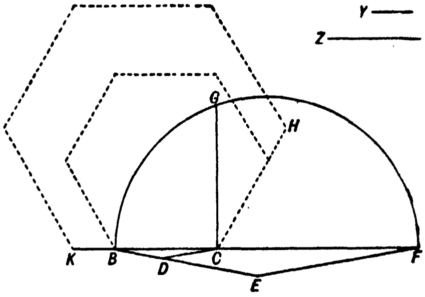
The area of the triangle ABC : the area of the triangle KHC in the duplicate ratio of the base BC to the base HC, *i.e.*, in the ratio of BC : CF or D : E.

PROBLEM 82.—*To describe a square, the area of which shall be to that of a given square in a given ratio.* Let BC be a side of the given square, and the ratio of D to E the given ratio. Produce BC, and on the produced portion take BF a fourth proportional to D, E, and BC. Find CG, the mean proportional between BC and CF. About C as centre, with radius CG, describe an arc of a circle meeting BC (or BC produced) in H. The square described on HC is the square required.



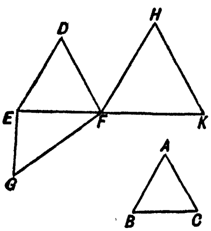
Each square is double the triangle formed by two sides and a diagonal; thus the little square is double the triangle GHC. Consequently squares, like triangles, have their areas in the duplicate ratio of their sides. Hence the construction.

PROBLEM 83.—*Given a plane rectilineal figure, to describe another and similar plane rectilineal figure, whose area shall be to the area of the given figure in a given ratio.* In this example let the given plane figure be a regular hexagon on BC, and let the ratio of Y to Z be the given ratio. Proceed as in the two preceding problems. We give the construction in full. Draw a straight line, making any convenient angle with BC, and from it cut off BD equal to Y, and DE equal to Z. Join DC, and draw EF parallel to it, meeting BC produced. On BF describe a semicircle, and draw CG perpendicular to BF and meeting the arc of the semicircle in G. CG, the mean proportional of BC and CF, gives the length of the side of the required figure, which may be formed of parallels in the position HCK or elsewhere, as convenience may suggest.



In a similar manner the area of any polygon, regular or irregular, may be enlarged or diminished, or the area of a circle. In the case of circles, diameters generally take the place which is given, in the case of polygons, to sides.

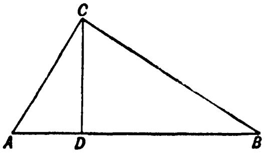
PROBLEM 84.—*Given two similar plane figures,* *to describe a third equal in area to their sum.* Let ABC and DEF be the two given similar figures—in this example triangles. Describe the right-angled triangle FEG, having its sides FE and GE (containing the right angle) respectively equal to corresponding sides of the given triangles. A similar triangle described upon any straight line, as FK, equal in length to the hypothenuse FG, is equal in area to the sum of the two given ones.



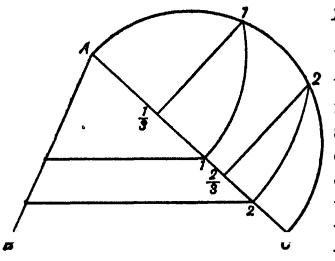
If the area of the new triangle is to be equal to the difference in area of the two given triangles, the right-angled triangle to be employed in the construction is that in which EF, a side of the larger of the given triangles, determines the length of its hypothenuse, and BC the corresponding side of the smaller triangle, as before, one of its two sides, the remaining side giving the length of the side of the triangle required.

Any similar rectilineal figures may be treated in the same way; or any two circles, using diameters or chords of similar segments (to be explained hereafter), in the place of sides.

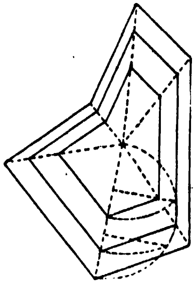
If in any triangle ABC, right-angled at C, a perpendicular be drawn from C to the hypothenuse, meeting the hypothenuse in D, AB : BC :: BC : BD, *i.e.*, AB : BD in the duplicate ratio of AB : BC. Similarly AB : AD in the duplicate ratio of AB : AC. If, then, similar figures be described on the three sides of ABC, their areas are proportional to AB, BD, and AD, the latter two being therefore together equal in area to the first.



PROBLEM 85.—*To divide the area of a given triangle into a certain number of equal parts by parallels to the base.* Let ABC be the given triangle, BC being the base; and let it be required in this example to divide the given triangle into three equal parts. Divide the side AC into three equal parts. Describe a semicircle on AC as diameter, and draw perpendiculars from the points of section, meeting the arc of the semicircle in the points marked 1 and 2. About A as centre, with the radii A 1 and A 2, describe arcs of circles, meeting AC in the points also marked 1 and 2. From the last-mentioned points draw parallels to BC, dividing the area of the triangle as required.

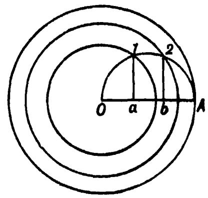


A 1 is a mean proportional between A $\frac{1}{3}$ and AC; and A 2 between A $\frac{2}{3}$ and AC. The duplicate ratio of AC to A 1 is that of AC : A $\frac{1}{3}$; and of AC to A 2 is that of AC to A $\frac{2}{3}$.



Any polygon, regular or irregular, may be divided into equal areas by cutting it up into triangles, dividing one triangle as above, and then drawing parallels to the sides, as shown in the accompanying figure.

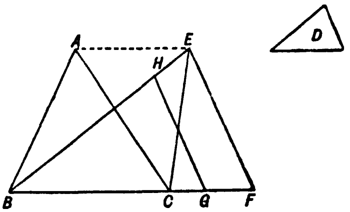
PROBLEM 86.—*To divide a given circle into a given number of equal or proportional parts by means of concentric circles.* Let the given circle be the circle having the centre O, and radius OA. Divide OA into the given number of equal parts, say three, in the points *a*, *b*. On OA describe a semicircle, and at *a* and *b*, the points of subdivision of OA, erect perpendiculars, intersecting the arc of the semicircle in the points 1, 2. About O with the radii O 1 and O 2, describe circles, dividing the area of the given circle into three equal parts.



Whether OA be divided equally or unequally, the corresponding circles will divide the area of the given circle in the same proportion.

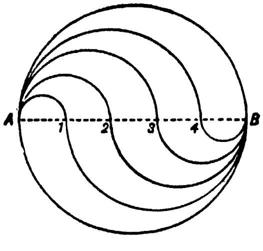
PROBLEM 87.—*To describe a triangle similar to one given triangle and equal in area to another.* Let the triangle ABC be given to determine the area, and D to determine the form.

Through A draw a parallel to BC. At B in BC make an angle equal to one of the angles of D, and let the other side of this angle meet the parallel in E; and at E in BE make a second angle equal to a second angle of D, the other side of the angle meeting BC, produced if necessary, in F, so that the triangle BEF is similar to the given triangle D. Join EC, forming the triangle BEC equal in area to ABC, the given



area. Take **B G** a mean proportional between **B C** and **B F**. Draw **G H** parallel to **F E**, forming **B G H**, the triangle required.

PROBLEM 88.—*To divide a given circle into a given number of parts equal to each other both in area and perimeter.* Let the circle on **A B** as diameter be the given circle, and let it be required in this case to divide it into five equal parts. Divide **A B** into the same number of equal parts at the points 1, 2, 3, and 4. On A 1, A 2, A 3, and A 4, and on the upper or under side of these lines, describe semicircles; then on B 4, B 3, B 2, and B 1, and on the under or upper side of these lines, describe semicircles running into the former ones, and completing the figure.



MUSIC.—VII.

[*Continued from Vol. I., p.* 340.]

PITCH.

THIS subject was partially dealt with in Vol. I., p. 32. In the exercises that have been given the selection of a sound for the key-note or *doh* has been left to the discretion of the pupil, who, of course, best knows the range of his voice. But for many musical purposes it is necessary to define the exact position of a sound in the whole region of sounds made use of in music. The ear distinguishes pretty clearly a range of about eight octaves, *i.e.*, the scale **d r m f s l t** eight times over. A modern grand pianoforte, then, provides fully for the capacity of the ear. Human voices, from the lowest bass to the highest treble or soprano, have together a range of about four octaves. The position of a sound in the whole series is called its PITCH, and for the purpose of clearly identifying the pitch of a tone it is necessary to employ SYMBOLS OF PITCH. It is unfortunate that musicians do not universally and exclusively use one set of pitch names. Thus, in accordance with the usage of Germany and other countries, the greater number of popular singing teachers in this country have long used terms taken from the alphabet; but many other teachers, and especially teachers of solo singing (who are far more concerned with matters of voice delivery and phrasing than with the art of reading at sight from notes), use the sol-fa syllables to name pitch. Now there must ever be occasion to distinguish the scale position of tones (as the 1st, 5th, or 6th, etc.) and, in addition, the particular place of tones in the whole useable range of pitch; and for these two distinct purposes it is obviously convenient to employ two distinct sets of terms. In this course of lessons, therefore, alphabetical names will be employed for pitch, and sol-fa syllables to express the scale relations or positions of tones. It is worth while to remark that this use of the sol-fa syllables, so far from being new, preserves the usage of many centuries: the objectionable use of the sol-fa syllables as pitch symbols being comparatively recent.

Musical sounds are produced by rapid regular vibrations. Slow vibrations produce grave or "low" sounds, and quick vibrations produce acute or "high" sounds. A sound produced by about 256 vibrations in a second is called MIDDLE C. This sound is somewhat high in men's voices, and somewhat low in children's and women's voices. From this middle C a scale is built, and each successive tone is named by a letter of the alphabet. Tones an octave apart have the same alphabetical name. This scale is called the

STANDARD SCALE OF PITCH.

It is natural to ask why the usual alphabetical order is not followed in naming the tones of this scale. The only answer that can be made here is that in the early history of music other ways of regarding the scale were in vogue that justified the recognition of A as the starting-point of the scale series, and that the naming of the tones of the modern standard scale is a result of the older plan. It will be noticed that starting from the sixth and going on beyond the C the alphabetical order will be obtained.

Up. C^1 (512 vib.)	**C^1**	**doh^1**	8 or 1
	B	**te**	7
	A	**lah**	6
	G	**soh**	5
	F	**fah**	4
	E	**me**	3
	D	**ray**	2
Mid. C (256 vib.)	**C**	**doh**	1

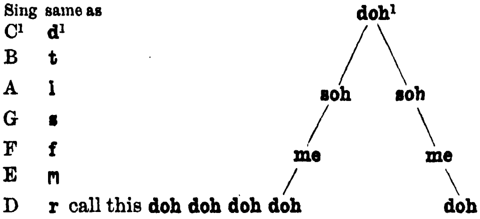
The sol-fa syllables are placed parallel with the alphabetical names to show that the tune formed by the standard scale is the same as that formed by the sol-fa syllables. Later lessons will show that this likeness is true only when *doh* is pitched on C. The order of letters in the scale should be repeated up and down until it is firmly impressed upon the memory.

FINDING PITCH.

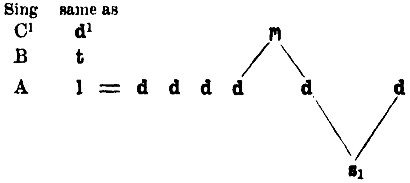
In lesson I. it was stated that pitch is difficult to memorise. If you strike, say, E on a pianoforte fifty or a hundred times every morning for a week the chances are that every evening you will find you have forgotten this particular pitch; and if you ultimately succeed with one pitch and then work at others you will find that the new pitches will obscure your sense of the first you acquired. Even years of practice on the part of musicians who give their lives to music do not enable them to gain more than an approximate and vague "sense" of pitch. On the other hand, it is curious to observe that persons of ordinary ability who spend comparatively a small portion of their time at the pianoforte are sometimes able to identify pitch without any apparent effort. The student may be encouraged to know that his progress is not dependent upon the possession of this exceptional sense, and that without it he may even attain eminence as a composer or performer. In fact, as has been repeatedly observed throughout these lessons, it is the sense of the *relations* of sound that must be naturally possessed and assiduously cultivated by the would-be musician. What then is the use of terms of pitch? First, they are indispensable in order to identify the notes of an instrument, such as the organ, pianoforte, etc. An instrumentalist rarely notices the relations of tones when he is reading from music: he notices only *localities* on his instrument. Then in describing the pitch position of key-tones and in describing the compass and particulars of voices terms of pitch are again indispensable. And for working out many problems of musical science and stating many musical facts the terms of pitch are equally called for.

The pitch of key-tones is always in some way stated at the beginning of a piece of music, and is called its KEY-SIGNATURE. It is by no means absolutely necessary that pieces should be sung at the pitch thus stated: they can be pitched higher or lower to suit the vocal capacity of the individual singer; but when pieces are sung by many singers unitedly the key stated is usually the best to adopt; and pieces sung to instrumental accompaniment must, of course, be performed in accordance with the key played.

A little instrument—a steel fork with two prongs—called a TUNING-FORK is useful for "pitching" keys (that is, for finding the proper pitch of keys) when a pianoforte or other musical instrument is not available. Tuning-forks are generally made to sound either the pitch A or high C. The C¹ fork, however, is the most useful one for singers. A small fork, called the Pupil's Fork, that will last a lifetime, can be obtained for a small price from Messrs. Curwen & Sons, Warwick Lane, London. From this fork all the keys to be used for the present can be found by striking the C¹ and running down the scale until the required pitch is reached. Suppose, for instance, D is to be found. Imitate C¹ from the fork, and sing down the alphabetical scale until D is reached, and after singing the sound of D to the syllable *doh* several times (in order to get rid of the impression of the key scale of C, and at the same time to establish the key of D), sing the *doh* chord. Thus:—



When the key is high in the scale of pitch, as, say, key A, the *doh* chord can be sung in another way. Thus:—



Other shorter methods of pitching keys will be described in later lessons.

REMEMBERING PITCH.

THE PITCH OF THE VOICES OF MEN, CHILDREN, AND WOMEN COMPARED.

It will be well to state here that the voices of men are as a class an octave lower than the voices of children and women. In singing tunes together or in imitating musical patterns from one another, children and the adults of both sexes sing in the "octave" they find most natural. A mixed congregation, therefore, singing the melody of a hymn tune will instinctively produce that melody in "octaves." So, an adult male singer imitating the sound of a C¹ tuning fork will naturally sing the C an octave lower. It must be understood, then, that in pitching keys men singers must find the key note in the "octave" they feel to be natural.

Although the pupil may not be able to learn to accurately pitch sounds without external aid, it is quite within the power of the humblest to acquire approximate ideas of pitch. The sound of C, for instance, can be found, if not truly memorised by the ear, with fair accuracy by singing it repeatedly and observing what amount of strain is required to produce it. Every pupil should endeavour to acquire at least this feeling for approximate pitch.

Notation of Pitch.

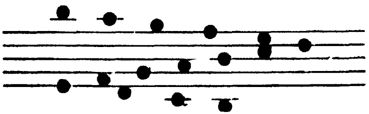
(Tonic Sol-fa Notation.)

As the Tonic Sol-fa notation of tune concerns itself mainly with the scale names or scale positions of sounds, symbols of pitch are used only to indicate the pitch of key-tones. In Tonic Sol-fa music this is done by stating at the beginning of a piece, and where a key is changed, Key A, Key F (meaning always that *doh* is to be A or F), etc., or that *doh* is A, *doh* is F. In these lessons the latter plan is followed, for reasons to be stated in a higher step.

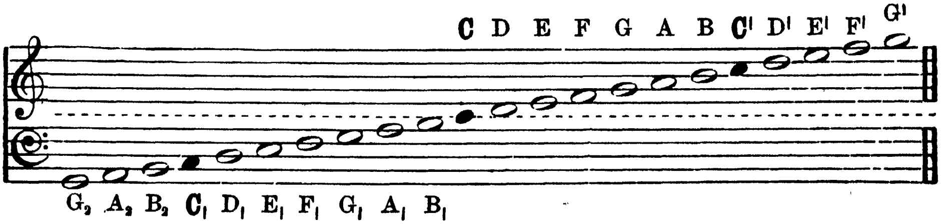
(Staff Notation.)

Although hitherto in these lessons the staff notation has been used as a notation of relations only, it is primarily a notation of pitch from which the scale name or position of a tone has to be inferred. Each line and each space on the staff has its definite pitch name. A five-lined staff, such as that we have used, provides therefore for a range of eleven tones, or, including a ledger line and additional spaces above and below, fifteen tones.

Staff and ledger lines to show fifteen tones.



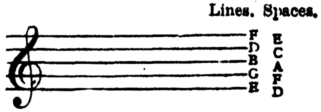
But even for the range of voices, viz., four octaves or twenty-nine tones (C up to C four times over) many more lines and spaces are obviously necessary. A **great staff** of eleven lines is therefore used, the lines and spaces of which are named as follows :—


C D E F G A B C^1 D^1 E^1 F^1 G^1
G_2 A_2 B_2 C_1 D_1 E_1 F_1 G_1 A_1 B_1

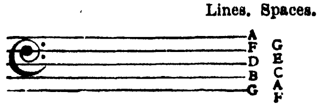
The C on the sixth line is called "**middle C**," and the notes above this pitch up to and including B are called the "**middle octave**." The octaves above this series are distinguished by figures placed on the top right-hand side, and the octaves below by figures placed on the lower right-hand side of the letter. Thus G (unmarked) is on the eighth line, G^1 is in the space above the staff, and G_2 is on the lowest line of all.

CLEFS.

In the above the middle line is dotted in order to facilitate calculation. The middle line, then, leaves respectively five lines above and five below. As five lines are sufficient to express the average range of any one voice, special signs called **clefs** are used to denote which particular lines are selected. A clef shaped thus 𝄞 means that the top five lines are selected. It is placed so that the eighth line of the great staff passes through its lower curve,



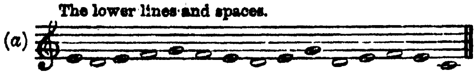
and it is therefore often called the G **clef**, as well as the **treble** (a treble voice is a high voice) **clef**. A clef shaped thus 𝄢 means that the lowest five lines are selected. It is placed so that the fourth line of the great staff passes through the two dots (÷),



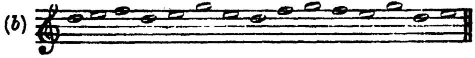
and it is therefore often called the F **clef**, as well as the **bass** (a bass voice is a low voice) **clef**. The student of the staff notation should now determine to learn by heart the pitch names of the lines and spaces in each clef, beginning with the treble clef because of its frequent use in the singing exercises that follow. In order to work at this no faculties of ear or voice are required: perseverance, observation, and memory are all that are called for. The quickest and surest way of impressing the memory is by writing exercises. Many pupils have been assisted by noticing that the spaces in the treble clef read upwards spell the word FACE, and nonsense phrases, such as Eat Good Buns Don't Fret, in which the initial letters of each word show the names of the lines read upward, are often a boon to pupils with weak memories.

Ex. 62.—Name the following notes:—

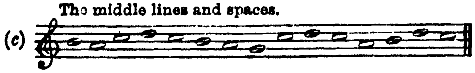
The lower lines and spaces.



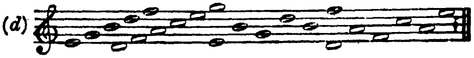
The upper lines and spaces.



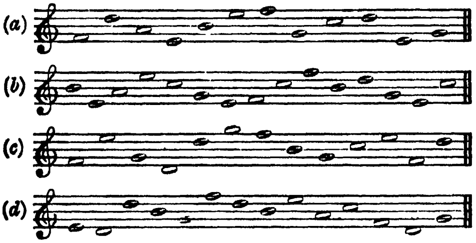
The middle lines and spaces.



All the lines and spaces.

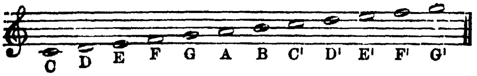


Ex. 63.—Name the following notes:—



Do not in the above exercises write the names against the notes as you find them. Prefer to call them out from beginning to end again and again until you can name surely and quickly.

In dictating notes the octaves on the treble clef will be distinguished as follows:—



where the high C and notes above have "octave" marks placed just above the letter on the right-hand side.

Ex. 64.—Draw five lines and a treble clef and write the following notes, using heads (o) as in the above exercises:—

E G D^1 F A F^1 B C^1 G E^1 A G^1 C^1 E D C.

Ex. 65.—Draw, etc., as above:—

A E^1 F D C C^1 B F^1 F A C B G E^1 C^1.

Ex. 66.—Draw, etc., as above:—

E^1 F^1 F C E^1 A G^1 F D C D^1 G^1 E A.

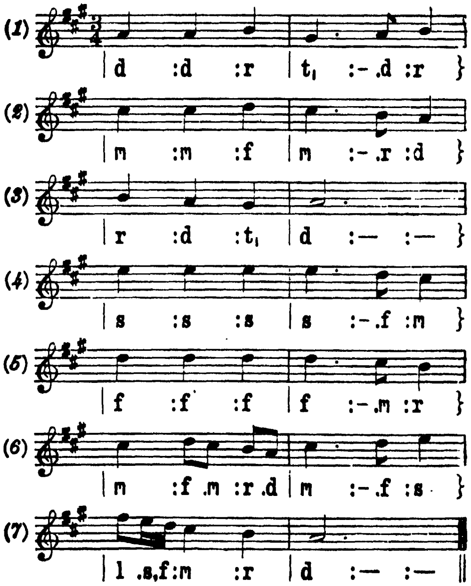
The signatures of keys and the reasons for their adoption will be explained in a later lesson. Meantime, the exercises now to be given will show the proper signatures, because it will sometimes be necessary to refer back to them.

RHYTHM.

Pulses considered separately are not interesting to the ear. In a piece of music or a tune a number of successive pulses are grouped together to form PHRASES or musical lines, and the pulses in such phrases are felt to cling to one another and to form a connected musical sense. Relations of accent and value thus presented form what is generally called RHYTHM. In most tunes there is much repetition of rhythm, that is, one phrase is rhythmically identically the same as other phrases, although it may differ completely in the use of scale tones. In this way VARIETY and UNITY, two essentials of MUSICAL FORM, are pleasantly and agreeably secured. The *National Anthem* aptly illustrates the use of rhythmic repetition. It is shown here in both notations, with the key and time signatures to be explained later on.

GOD SAVE THE QUEEN.

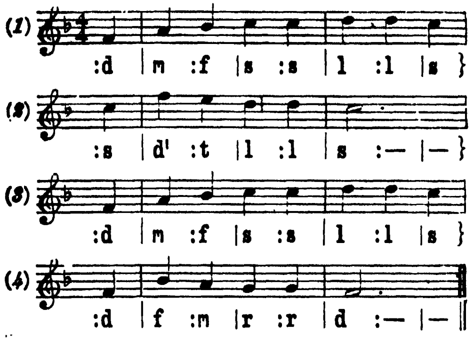
(*Example of rhythmic repetition.*)



It will be seen that lines (1), (2), (4), (5) are exactly alike in rhythm. It is difficult to learn by heart tunes that do not systematically repeat rhythmic effects. This is why all tunes intended for popular use, and therefore to be picked up by ear and sung from memory, employ so much repetition. A music-hall song or a "Moody and Sankey" tune often gets into vogue as much because of its rhythmic construction as because of its use of scale tones. In an ordinary plain hymn tune, however, the rhythm is not at all conspicuous, and repetition of the movements from tone to tone is the main help to the memory; as, for instance, in the tune

TALLIS.

(Example of tonal repetition.)


(1)
:d |m :f |s :s |l :l |s }
(2)
:s |d' :t |l :l |s :— |— }
(3)
:d |m :f |s :s |l :l |s }
(4)
:d |f :m |r :r |d :— |— ||

It will be seen that the 1st and 3rd lines are precisely the same, and that the 4th line exactly imitates, lower in the scale, the rise and fall of the 2nd line.

HISTORIC SKETCHES, ENGLISH.—VII.

[*Continued from Vol. I., p.* 330.]

THE ENGLISH IN FRANCE.

UNTIL some time after George III. had been on the throne the style and title of our monarchs was "King of Great Britain, France, and Ireland." Even when James II. was a fugitive from his kingdom, and was magnificently entertained by Louis XIV. at St. Germains for a series of years, he still retained the empty title of king of the country where he was dwelling as a guest. To be sure, he was virtually as much King of France as he was King of England, but to the latter title he had much more than a mere pretension, and the title of King of France was historically bound up with it. Yet in James's time (1685–1688), even the echo of the old shout of Henry V., "No King of England if not King of France," had died away, and there was neither rhyme nor reason in keeping up this ridiculous and barren name.

Time was, however, when the assumed title represented a reality; when, though not without dispute, the Kings of England were acknowledged to be also Kings of France. Let us look for a while upon a scene whereon the mark of the English domination was stamped with such indelible plainness that all the waters of oblivion that have flowed past it since have not sufficed to wash it away—a scene which will remain as an historical memory to the end of time, and which showed, incidentally at least, this, that the English were wholly unworthy of their position as lords of France.

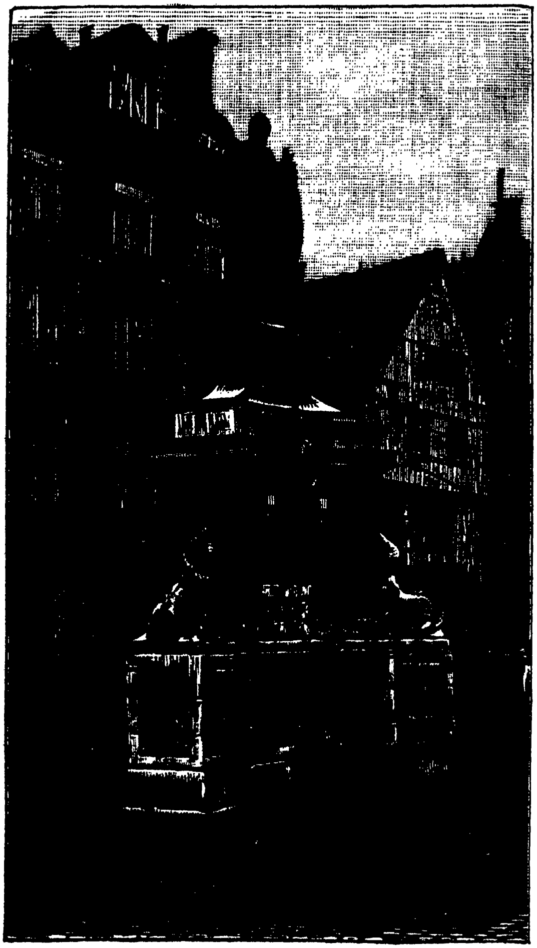
At daybreak on the 30th of May, 1431, a priest entered the cell of a young woman at Rouen, and announced that he was come to prepare her for death. Not that the prisoner was ill—she was young, healthy, and in the full possession of her faculties; the death she was to suffer was a violent one—she was to be burned alive. Burned alive at one-and-twenty! What could the poor wretch have done to merit such terrible punishment? She had shivered the power of the English in France; she had, by means of an enthusiasm which rendered her obnoxious to the clergy, roused the French nation from the torpor into which it had been thrown by the stunning blows dealt to it by Henry V. of England; she had dared to thwart the purposes and brave the anger of vindictive Churchmen like the Bishop of Beauvais and Cardinal Beaufort the Bishop of Winchester. The prisoner's name was Jeanne Darc, or Joan of Arc, called by the French La Pucelle (The Maid).

The priest's announcement took the poor maiden entirely by surprise. A week before she had been led out into a public place in Rouen, and compelled in a moment of weakness, when surrounded by enemies—not one kindly face among the crowd—and under circumstances of great excitement, to sign a document disavowing and solemnly abjuring certain charges of heresy which were preferred against her; and she had been told on that occasion that her life would now be spared, though she must resign herself to a sentence of perpetual imprisonment. The excuse for breaking faith with the poor girl was this, that since her abjuration she had said that St. Catherine and St. Margaret, with whom she asserted she was frequently in direct communion, had appeared to her, and rebuked her for her weakness in yielding to the threats of violence.

On first hearing the announcement of the priest, Jeanne's firmness gave way; she wept and gave vent to piteous cries, tore her hair, and appealed to "the great Judge" against the cruel wrongs done to her; but by degrees her self-possession returned, and she listened to the ministrations of the priest, received the last sacrament from him, and announced herself ready to submit to the will of God. At nine o'clock in the morning she was carried away in the hangman's cart to the market-place of Rouen, where had already been laid the funeral pyre on which the young victim was to be sacrificed. The Bishop of Beauvais, Cardinal Beaufort, and several other prelates, with the English military commanders, were there, and a vast crowd had come out to see the "Maid of Orleans" die.

In the centre of the market-place, about the spot where now stands a fountain surmounted by a figure of Jeanne Darc, the stake was reared, and around it were piled the fagots. Soldiers guarded the place of execution. The ceremonial of death was begun on that beautiful May morning by a sermon in which the crime of heresy was vehemently denounced, then the savage sentence pronounced by the shepherds of the flock on the ewe lamb before them was published, and the signal was given to proclaim the last act of the tragedy. A soldier's staff was broken and formed into a rough cross, which the "Maid" clasped to her breast. She was then bound to the stake, the fagots were lighted, the fire leaped up around her, and after suffering the agony indispensable to death by burning, her spirit fled. The English cardinal watched the whole proceedings with unmoved face, and when his victim's life was beyond his reach he ordered her ashes and bones to be gathered up and to be cast into the Seine.

Was it really heresy for which this poor girl suffered? Ostensibly it was, but had Jeanne's heresy stood alone it would scarcely have provoked the interference of potentates like those who "did her to death." Upon her head, when bound to the stake, they fastened a cap on which was written her accusation, "relapsed heretic, apostate, idolatress," but they did not write the true cause of their unholy zeal in setting the Church's law in motion against her, that cause being the crushing defeat Jeanne Darc had inflicted upon the English political influence in the country. But how came the English in the country at all? Was it by way of revenge for the conquest of William the Norman, or did it spring out of some after-born political entanglements?



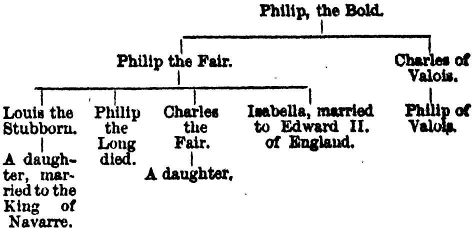
PLACE DE LA PUCELLE, ROUEN.

The claim of the English kings to be kings also of France began to be seriously mooted when Edward III. was Prince of Wales, and when he came to the throne the question was taken up with ardour when once he was aroused from the lethargy which in the earlier days of his reign seemed to be the forerunner of an inglorious era. In 1337, ten years after he had been on the throne, Edward lacked occupation, and manifesting a desire to let his energies find vent in true Plantagenet fashion, listened to the advice and remonstrance of some of those about him, who urged him to assert his right to the crown of France.

The way in which he claimed it is almost too barefaced to be written down; and while it is certain that few of those who fought on his side so valiantly and well knew the real merits of the case, it is likely that he himself was not very expert in tracing his genealogy. Those who had motives of their own for the war, and who hoped to win fortune and rank for themselves out of it, told him he had a righteous cause, and he, gladly convinced, believed them. It was the custom in France, borrowed from the Salian Franks, who had become absorbed in the nation, to exclude women from the succession to the throne, and when a woman came in the direct line of succession her place was taken by the male heir nearest related to the late king. This custom had been sanctioned by the approval of several hundred years, during which time no one who founded his title through a female had mounted the throne. When Philip the Fair died in 1314 he was succeeded by his son, Louis the Stubborn, who died without male issue, and Louis's brother, Philip the Long, succeeded him, being himself followed in 1322 by his younger brother, Charles the Fair.

Philip the Long had died without issue, and on the birth of a daughter to Louis the Stubborn the estates of France decreed her exclusion, and the exclusion of all females in future. Charles the Fair's only child was a daughter, and with Charles was extinct the direct male line of Philip the Fair. Philip's fourth child was a daughter, Isabella, married to Edward II. of England, and it was taken for granted that the law of exclusion which applied to Louis the Stubborn's daughter, married to Charles King of Navarre, and which applied to the daughter of Charles the Fair, applied also to Isabella, their aunt. So thoroughly did this opinion prevail, that when Philip of Valois, nephew of Philip the Fair, claimed the throne on the death of his last male cousin, his claim was allowed as reasonable and unquestionable by the whole nation, and no one so much as thought of a claim being made on behalf of Isabella by her son. The exact position of affairs may be best seen from the annexed table.

Jeanne Darc Summoned to Execution.



Not only did Philip take undisturbed possession of the throne, but, as a matter of course, he summoned King Edward to do homage to him, as his liege lord, for the province of Guienne, which belonged to Edward as feudal tenant of the French king. Edward obeyed, rendered homage, and thus virtually acknowledged Philip's right to be king. But he did so only because it was not convenient to have a quarrel on his hands at the time. He had a Scotch war to fight, troublesome subjects at home to curb, and there was a plentiful lack of that sinew of war—money—without which it is useless to try to uphold even the strongest claim. When these troubles were over he listened to the suggestions of Robert of Artois, a renegade French nobleman, who, having been treated badly by Philip the Fair, took an ignoble revenge by giving his services to the foes of his country. Edward looked about for allies before launching forth on a great war with France, and he secured the friendship of the Counts of Flanders, Brabant, Namur, Gueldres, and Hainault, and the powerful assistance of the rich citizens of Ghent, represented by the brewer, Jacob van Artevelde. Having gained these allies, and coaxed Parliament to give a large supply in aid of the war, Edward proceeded to pick a quarrel. He complained that Philip had helped the Scots in the late war between Scotland and England, and that he still protected the Scotch king, a personal enemy of his. Finally, he renounced his homage, and defied the French king, who, knowing that the contest must come, buckled to with a will, determined to suffer anything rather than admit Edward's claim to the French crown.

At first matters did not go happily; the English king, who elected to attack from the side of Flanders, had great difficulty in keeping his allies together; and though he did advance with 50,000 men into French territory, he did not fight, and returning into Flanders, disbanded many of his troops. Charges to the extent of £300,000 had been incurred; the money given by Parliament, and that raised by pawning the crown jewels and the personal effects of the king, was all gone, and not a foot of French land had been won. The Parliament, in the king's absence, refused supply except on the condition of redress of grievances, and it seemed as if the royal expedition after the French crown must end in an inglorious fiasco. Suddenly Edward appeared in London, wrung a heavy grant out of the Parliament, and proceeded to fit out a fresh force against Philip, notwithstanding that the Parliament told him it owed him no allegiance as King of France, and that if won, France must ever remain a separate part of the kingdom.

On June 24, 1340, Edward's fleet, well manned and sound, came up, off Sluys, with the French fleet of four hundred sail, which Philip had prepared to intercept Edward's army in its descent on the coast. A bloody battle ensued. The English were the better sailors, and manœuvred so as to take every advantage of the enemy, who lost the greater part of their ships and upwards of 25,000 men. This crushing victory, of which Edward was not prepared at the moment to take advantage, fixed an unbridgeable gulf between the goodwill of the two nations. National prejudice, national hatred had their birth in it, and from the battle of Sluys dates the dreadful animus which existed down to quite recent times between the English and French. From the same event, however, dates the welding of the English nation into one homogeneous whole; the lords ceased to affect French ways and the French language—which, historically speaking, was theirs—and identified themselves with the country which was their real home. After the battle of Sluys the word "Englishman" ceased to be a term of reproach.

The battle of Sluys, the first brilliant victory of the English navy, was barren of immediate result so far as Edward's claim to the French crown was concerned. As usual, when a French war broke out, the King of Scotland broke the peace by way of diversion on his side, and Edward had to turn the whole of his strength against his northern enemy, who must necessarily be crushed before a foreign war could be carried on. In 1346, however, Edward, with the English nation at his back, set out on the campaign which ended on the field of Creçy, and which was followed ten years afterwards by the rout of Poictiers (1356), where the French king, John, was captured by the Black Prince, and brought prisoner to London. The exhausting efforts made during the campaign were such as to prevent Edward from following up his splendid successes, and he was glad to arrange, by the Treaty of Bretigny (1360), for a long truce.

Various reasons conspired to prevent the resumption of hostilities on a grand scale during the rest of Edward's long reign. The English remained masters of large portions of French territory, and the claim of the English king to the crown was not abandoned, but kept as a sword in the scabbard, for use at a convenient season. The son of the Black Prince, Richard of Bordeaux, who succeeded to his grandfather's crown, did not succeed to his energy or his ability, and the English claim was virtually dormant during the whole of his reign, while the French were employing the time in recovering from the effects of Edward's blows, and in winning back most of the territory they had lost. Henry IV. had not leisure from home troubles to pursue the war, though he seems to have been desirous of doing so, not only as King of England, but by way of paying out the French king for his something more than neglect of him at the time he was in exile as Henry of Bolingbroke. When Henry V. succeeded, he had a large stock of energy to expend, a quiet kingdom, and a fairly stocked treasury; he had plenty of brave spirits about him, and within him was an ambition which would have taken him to Constantinople or to the capital of the Great Mogul. He determined to assert his claim to the crown of France.

To a king in his frame of mind an occasion of declaring war could not long be wanting, and there were several causes which allowed of his choosing his own time and opportunity. He set about his work deliberately, sent a special embassy to France to demand his right, and when that embassy returned from its bootless errand, he prepared with diligence and the utmost circumstance to enforce his claim with the sword. In the month of August, 1415, he sailed from Southampton with one of the finest armies ever mustered in England, landed at Harfleur, which he besieged and captured, and then prepared to advance on Paris. An enemy worse than all the French armies put together came into his camp. Dysentery smote down hundreds of his men, including some of the bravest and wisest, and so weakened the remainder that they could scarcely walk. Henry was obliged to abandon the idea of going to Paris, and gave orders for a march to Calais, whence he proposed to embark his enfeebled army for England. At Agincourt the French army, which had been hanging about him, barred his advance. It consisted of full three times the number of the English, and was commanded by the Dauphin, the French king's eldest son, and by the flower of the French nobility. The French were confident of victory, the English were in a desperate case, and the battle was joined with an amount of fury seldom witnessed even in those days. The French were utterly routed (October 25, 1415), vast numbers of them were slain, and the shattered remains of the English army pursued its march unmolested to Calais.

In the next campaign, which was not undertaken till two years afterwards, Henry met with but little resistance in the open country of Normandy, though Rouen was stoutly defended. He reduced Rouen and other towns, and marched to Paris, which he mastered, and dictated terms in the capital of his enemy. The French king, Charles VI., was imbecile, and the Treaty of Troyes, to which the Dauphin refused to be a party, provided that Charles should be called King of France during his lifetime, but that Henry should really administer the government, and that after Charles's death he and his successors should be acknowledged as Kings of France. Henry strengthened the band by marrying Catherine, daughter of the French king, and during the rest of his life he did actually rule over France and receive the homage of her vassals.

In the height of his power Henry was struck down by a fever, and left his son, an infant of nine months old, to the guardianship of the Duke of Bedford and the Duke of Gloucester. This was in 1422. For five years Bedford, who managed with singular tact and prudence, succeeded in keeping things pretty straight, in spite of numerous causes of trouble and disturbance, including, of course, the efforts of the Dauphin, who in the meantime had become Charles VII., to regain his father's throne. Charles had a large following, especially in the south-east of France, and he was able to possess himself of a few towns of strength and importance. Orleans was of the number, but it was closely besieged by the English under the best of their generals, and Charles despaired of relieving it, and thought of going to Languedoc, there to make a final stand.

Then arose Jeanne Darc, a peasant girl, who saw, or believed she saw, visions of the saints, especially of St. Catherine, who came to her and told her she must deliver France from the presence of the English. Her "voices," as she called them, bade her don man's attire, and directed her to fetch a certain sword from a neighbouring church dedicated to St. Catherine. She was permitted by the authorities to follow her bent, and was furnished with armour and a horse. At first the regular soldiers laughed at her, but soon they got to regard her as a prophetess, heaven-sent for the deliverance of France. Under her guidance—in strictly military operations she was assisted by Dunois, governor of Orleans—the men fought with a courage which increased in proportion as her fame as a prophetess grew, and struck fear into the ranks of the English. Orleans was relieved by the "Maid" in person, and the garrison, now strong enough to attack its besiegers, sallied forth and drove the English from several of their positions. Subsequently another sally was made, a bloody battle was fought, the English lost 2,000 men, and Lord Talbot, afterwards Earl of Shrewsbury, was made prisoner. The Duke of Suffolk raised the siege, retiring to Paris, and Charles was crowned King of France with great solemnity at Rheims.

With these signs of returning prosperity many wavering nobles and towns declared for Charles, and the Duke of Bedford had enough to do to hold Paris and the strictly English parts of France. Jeanne, believing her mission to be over, was anxious to return to her former home in Lorraine, but was over-persuaded by Dunois to remain with the army till the English should be driven out of France. She remained, and in a sortie made by the garrison of Compiègne was captured and given over to the English authorities. The English, partly from superstition, partly to excuse the disgrace of their defeats, said that the "Maid" had a devil, and that she had done her work through magic. They hoped by punishing their prisoner not only to take revenge, but to show the French that their prophetess was a woman after all.

The Duke of Bedford handed her over to the Church, with what effect we have seen already; and from the moment of her death the English power seemed to be stricken with mortal sickness. Place after place was wrested from them, Paris drove them out, the Duke of Burgundy forsook their alliance, and when in 1435 the Duke of Bedford died their influence in France was at a very low ebb. A war of reprisals was carried on till 1443, and then a truce was agreed upon which either side broke or kept as it suited their convenience.

Then came the English Wars of the Roses, during which disastrous period the claims to France were not thought of, and it never happened to any prince after Henry VI. to have power or opportunity to pursue the right which was never formally renounced. Kings of England continued, nevertheless, to write themselves down Kings of France, even after the loss, in Mary's reign, of their last remaining possession, Calais. Indeed, it was not, as stated at the beginning of this paper, until George III. ascended the throne that the title appeared to those interested so ridiculous that it was ordered to be expunged from the style and description of his majesty of Great Britain.

See:—Brougham, *House of Lancaster; Cassell's History of England.*

ENGLISH.—VII.

[Continued from Vol. I., p. 333.]

THE ARTICLES (*continued*).

THE DEFINITE ARTICLE.

THE definite article, *the*, was originally a demonstrative adjective pronoun, and is therefore properly used to qualify nouns. In old English it had inflections of gender, number, and case. Its forms in the nominative singular were *se*, *the* (mas.); *seo*, *theo* (fem.); *thaet*, *that* (neut.).

As early as the twelfth century, however, its inflections began to disappear from the language, and since then it has remained invariable, retaining the same form in both numbers, and in all genders and cases. One single trace of its inflectional stage is still left to us.

In the common phrase, "the more the merrier," *the*, though it has the invariable form of the definite article, is not the nominative but the instrumental case. In Latin it would be termed the ablative, and the two *the's* would be rendered by *quo* . . . *eo*. For instance, the following sentence from Livy:

> "Quo plures erant Veientes, eo major caedes fuit,"

may be rendered into English:—

> "*The* more men there were from Veii, *the* greater was the slaughter."

In poetry the *e* of *the* is frequently elided if the word which follows it begins with a vowel. This is perfectly natural, as the article *the* is rarely emphatic. In the cases in which, as will be afterwards explained, it is emphatic, it cannot undergo elision. Examples:—

> "Great in the earth, as in *th'* æthereal frame."
> "Where should this music be? I' *th'* air, or *th'* earth?"

In a few passages the *e* of *the* is elided, although the following word begins with a consonant. Example:—

> "Who merit, ought indeed to rise i' *th'* world."

THE USES OF THE DEFINITE ARTICLE.

The typical use of the definite article is to denote an individual object which is familiar, or has been mentioned before, or generally to limit or define an object. Thus, if we speak of "*a* man," we mean any individual of the human race; if, on the other hand, we speak of "*the* man," we mean some definite *man* who has been mentioned before, or who is quite familiar to our hearers. That is to say, in the expression, "the man," *the* limits and defines *man*. We shall afterwards point out to you in detail the uses of the definite article, but a little careful thought will convince you that in nearly every case the use is but a variety of the general usage set forth above. The following examples will illustrate the general use of the definite article:—

> "*The* tobacconist sturdily stood forward and scouted *the* motion."
> "*The* prisoner was presented before *the* magistrates."
> "He says *the* king intends to send us gold.
> Explain about *the* gold: speak more distinctly."
> "*The* lugger was piloted with great ability."

1. The definite article frequently precedes a noun which is already limited or defined,

(*a*) by an adjective:—

> "I wish you could have seen *the* dusky visages of my Indian attendants."
> "*The* honest gentleman was much flattered by the proposal."
> "The gentleman on *the* grey horse."
> "William the Conqueror came to England in *the* year 1066."

(*b*) by a prepositional phrase:—

> "They lingered round *the* grave of their disappointed hopes."
> "*The* clank of irons was heard upon the stair."

(*c*) by a relative clause:—

> "This is *the* idea which has acquired a right to the epithet of divine."
> "*The* stone, which the builders rejected, the same has become the head of the corner."

2. The definite article frequently denotes a whole class. This use seems at first sight quite opposed to what we have said is the general use of the definite article—namely, "to limit or define." However, when we remember that it is only by denoting a representative of the class that it denotes the class, we shall see that this usage is by no means

inconsistent with the use of the article already laid down:—

> "*The* miser and *the* spendthrift are both unprofitable citizens."
> "*The* hero, by never dreading failure, commands success."

3. The definite article is used before a superlative adjective. The reason of this is obvious; the superlative denoting one definite object, which surpasses in some quality or other all similar objects, must naturally be limited or defined by the definite article. Examples:—

> "*The* most unkindest cut of all."
> "*The* bravest man that ever drew a sword."
> "*The* fairest of her daughters, Eve."

4. Not very dissimilar from the last use is the use of the definite article to express exclusiveness, to point to one object as "*the* one above all others," "the celebrated," &c. Examples:—

> "I am *the* tainted wether of the flock.'
> "I am alone *the* villain of the earth.'

This is the emphatic use of the definite article, which, when thus used, should never have its effect weakened by elision.

5. The definite article is placed before nouns which denote the only object of its kind. Examples:—

> "The glorious lamp of heaven, *the* sun."
> "I'd rather be a dog and bay *the* moon.

So we speak of *the* air, *the* earth, *the* sea. If, however, earth, air, or sea is personified, the article may be omitted, as it also frequently is in poetry, when there is no actual personification.

6. Before the names of persons who occupy a unique and solitary position the definite article is generally placed. Thus we speak of *the* Archbishop of Canterbury; *the* Queen of England, &c. To this rule there are exceptions. For instance, if we use the words *queen*, *archbishop*, &c., as the titles conferred on individuals, the article is omitted. Examples:—

> "Queen Victoria ascended the throne in the year 1837."
> "Archbishop Laud was beheaded in the reign of King Charles the First.'

But:—

> *The* Emperor William.

7. With proper names of persons the definite article is only used in the following exceptional cases:—

(*a*) When the proper name is defined by an adjective or relative clause. Examples:—

> "Here is the rent *the* envious Casca made."
> "For them *the* gracious Duncan have I murdered."
> "That is not *the* Hazlewood whom I knew some years ago."

(*b*) When the chief of a clan or tribe is mentioned. Examples:—

> *The* O'Donoghue.
> *The* O'Gorman Mahon.
> *The* Bruce. *The* Douglas.

(*c*) When it is intended to convey an impression of notoriety. Example:—

> "To leave *the* Talbot and to follow us."

This use is particularly common before the names of women: *e.g.*—

> *The* Dubarry.

(*d*) Under this head we may class the use of the definite article before the names of sects, nations, &c. Examples:—

> *The* Romans. *The* French. *The* Evangelicals. *The* Arians.

It may be noticed here that the effect of prefixing the definite article to such words as those quoted above is to convert what are really adjectives into nouns. On this point we have already said something (Vol. I., p. 108).

8. Before the names of places, countries, seas, rivers, &c., the definite article is omitted or inserted in what appears to be a perfectly arbitrary way.

(*a*) It is always omitted before the names of towns, countries, or quarters of the globe—*e.g.*, Europe, Asia, London, Germany, &c. Districts, however, which take their name from lakes, mountains, or forests in their neighbourhood, have the definite article prefixed to them. Examples:—

> *The* Lakes. *The* Black Forest. *The* Salzkammergut. *The* Riviera.

(*b*) The general rule for rivers, oceans, and seas, is that they are prefixed by the definite article. In poetry and picturesque writing this rule is often disregarded. Example:—

> "There twice a day *the* Severn fills:
> The salt sea-water rushes by
> And hushes half *the* bubbling Wye,
> And makes a silence in the hills."

So we say *the* Thames, *the* Rhine, *the* Seine, *the* Indian Ocean, *the* Red Sea. In the language of poetry rivers are frequently personified, and then the article is omitted. Example:—

> "Beautiful Paris, evil-hearted Paris,
> Came up from reedy Simois all alone.'

(*c*) Mountains, regarded singly, do not generally take the article. Thus we speak of Ben Nevis, Helvellyn, Scawfell, &c. In naming foreign mountains we sometimes follow the foreign usage—*e.g.*, *the* Matterhorn, *the* Feldberg. With mountain ranges the case is different. The article is prefixed, even though the name of the range is singular—*e.g.*, *the* Cotswolds, *the* Grampians, *the* Alps, *the* Jura, &c.

(*d*) Capes, lakes, &c., do not take the article when they are mere titles, but only when they are followed by a prepositional phrase. Examples:—

> *The* Lake of Geneva. Lake Como.
> *The* Cape of Good Hope. Cape Wrath.

(9) Material nouns, as they denote all that exists of a material in the world, do not take the definite article. Examples :—

> "Iron is the most useful of the metals."
> "Corn is exported in vast quantities from Russia."

When, however, a material noun is limited by an adjective or relative clause, it takes the definite article, because this limitation implies that the whole of the material denoted by the noun is not referred to, but only a portion of it distinguished by certain peculiarities of its own. What we mean by this will be readily understood by comparing the following sentences :—

> Tobacco is a narcotic.
> *The* tobacco grown in England is not of the highest quality.

10. The majority of collective nouns follow the rules which affect common nouns, and may be preceded by the definite article. Examples :—

> "*The* crowd grew thicker as we climbed the hill."
> "*The* multitude followed him."

A few nouns of this class, however, are always used without the definite article, because they are so wide as to take in all humanity, and so do not admit of any limitation whatever. Such are *mankind*, *posterity*. Examples :—

> "Why should we do anything for posterity? Posterity never did anything for us."
> "The proper study of mankind is man."

11. Picturesque and distinctive names applied to ships, regiments, inns, &c., are frequently preceded by the definite article. Examples :—

> "A land-breeze shook the shrouds,
> And she was overset:
> Down went *the* Royal George
> With all her crew complete."
> *The* Black Watch. *The* Grenadiers.
> *The* Ship and Turtle. *The* Tabard.

12. As you have perhaps learnt in the French lessons, the definite article *le*, *la* in French is sometimes used instead of the possessive pronoun. This idiom is foreign to the English language, yet some traces of it exist in such phrases as "to shake *the* head," "to hold up *the* finger," &c. Such phrases, however, are rare, and of little importance, and are referred to here more as a curiosity than as examples of the English usage.

13. In Shakespeare and other early writers the definite article is placed before the relative *which*. It cannot be said to have much force when thus used, and in modern English it is never found in this conjunction. Example :—

> "Let your highness
> Command upon me; to *the* which my duties
> Are with a most indissoluble tie
> For ever knit."

14. The definite article is found after some adjectives, especially the numerals *all*, *both*, and *half*. Examples :—

> "It needed all *the* courage I possess to own the truth."
> "Both *the* gipsies were of a forbidding aspect."
> "Half *the* battle is to begin well."

15. In an earlier lesson we have given examples showing that the definite article prefixed to adjectives or numerals turns them into nouns. It will be enough for us now to give you a few examples, and to refer you back to Vol. I., p. 260. Examples :—

> "*The* poor are clothed; *the* hungry fed."
> "*The* three stood calm and silent."

REPETITION OF THE DEFINITE ARTICLE.

As a rule the definite article is not repeated when it applies to more than one noun. Thus we speak of *the* Prince and Princess of Wales. Similarly, when several adjectives qualifying one noun are preceded by the definite article, the definite article is only written once. Example :—

> "She was *the* youngest and most beautiful of them all."

This rule, however, is not invariable, and poets disregard it with great freedom. Example :—

> "*The* fair, *the* chaste, *the* inexpressive she."

EXERCISE 8.

In the following passage you will find plenty of examples of the articles both definite and indefinite. You will find it a useful test of your knowledge to try to explain the use of each of them, in accordance with the rules we have given above. The passage we give you is a letter from Alexander Pope in 1713 to Sir William Trumbull, concerning Addison's play, *Cato*, which had recently been produced :—

"*April* 30, 1713.

"I have been almost every day employ'd in following your advice and amusing myself in painting, in which I am most particularly oblig'd to Mr. Jervas, who gives me daily instructions and examples. As to poetical affairs, I am content at present to be a bare looker-on and, from a practitioner, turn an admirer, which is (as the world goes) not very usual. Cato was not so much the wonder of Rome in his days as he is of Britain in ours; and tho' all the foolish industry possible has been used to make it thought a party-play, yet what the author once said of another may the most properly in the world be apply'd to him on this occasion—

"Th

one si[illegible] other; while the author sweated behind the scenes with concern to find their applause proceeding more from the hand than the head. This was the case, too, of the prologue writer,* who was clapp'd into a stanch Whig at almost every two lines. I believe you have heard that at the applauses of the opposite faction my Lord Bolingbroke sent for Booth, who play'd

---

* Pope himself.

Cato, into the box, between one of the acts, and presented him with fifty guineas, in acknowledgment (as he express'd it) for defending the cause of liberty so well against a Perpetual Dictator. The Whigs are unwilling to be distanc'd this way, and therefore design a present to the same Cato very speedily; in the meantime they are getting ready as good a sentence as the former on their side: so betwixt them 'tis probable that Cato (as Dr. Garth expressed it) may have something to live upon after he dies.—I am, yours, etc."

PHYSICAL GEOGRAPHY.—VII.

[Continued from Vol. I., p. 326.]

THE NATURE OF THE INTERIOR OF THE EARTH AND ITS ACTION AT THE SURFACE—EARTHQUAKES, VOLCANOES, AND MOVEMENTS OF THE EARTH'S CRUST.

The Interior of the Earth.—The mention of rocks that have originated below the surface of the earth leads us naturally to the consideration of the earth's interior. As our deepest borings and mines extend less than a mile downwards, we can only guess at various answers to the questions that arise as to the nature of that interior.

The rocks of which the bulk of the earth's surface, and of all that part which we can actually examine, and which we term the *crust* of the earth, is composed, weigh about two or three times as much as water. Experiments made with the pendulum and plumb-line, and in other ways, as to the attraction exerted by the earth on other bodies, indicate, on the other hand, that our planet, as a whole, has a density of 5 or 5·5, *i.e.*, is five or five and a half times as heavy as water, or twice as heavy as the rocks forming its crust. This suggests that the interior of the earth consists of very much heavier materials than its crust.

As all substances gravitate towards the centre of the earth, the density of any substance will, if no counteracting force comes into play, become greater in proportion as it approaches the centre. Air, for instance, would at a depth of thirty-four miles be as heavy as water at the surface; water at a depth of three hundred and sixty-two miles as heavy as mercury. We might, therefore, expect the earth as a whole to be, not only twice, but vastly heavier, than the rocks at its surface. That it is not so can only be satisfactorily accounted for by the existence of some force within the planet opposing this increase of density; and the only known force capable of producing this effect is heat. We are thus led to the conclusion that the earth's interior is at so high a temperature that its materials are sufficiently expanded to counteract the progressive increase of density downwards.

Of this intensely heated condition of the interior we have independent evidence, not only in the phenomena of volcanoes and geysers arising from unknown depths, but more especially in the gradual downward increase of heat observed in mines, wells, and borings. The sun's heat does not extend to any considerable depth, and the varying conductivity of the rocks, both for solar heat and for that derived from the interior of the earth, causes the rate of this increase to be very inconstant; but it averages 1° Fahr. for every 64 feet of descent below the line at which the sun's heat ceases to be felt. The water of the artesian well at Grenelle, near Paris, 1,798 feet deep, is nearly 82° Fahr.; whilst the St. Gothard tunnel gave a rate of 1° Fahr. for 38 feet. Local centres of volcanic heat, or underground masses of uncooled igneous rock, may account for these variations.

If such a rate of increase of temperature as 1° for 64 feet should continue, the heat at a comparatively small depth would be sufficient to fuse any rock at the earth's surface. Thus at a depth of about 12,000 feet, or 2¼ miles, water would reach a temperature of 212° Fahr., that at which it boils when at the earth's surface; and at from 20 to 45 miles a heat would be attained sufficient to melt all known rocks. It does not, however, follow, as was once supposed, that the interior of the earth is in a liquid or molten state. Increase of pressure prevents solids from expanding into liquids, just as it prevents liquids from passing into gas. The enormous pressure within the earth may well keep it in a solid state in spite of its intense heat; but if this pressure be locally relieved by movements in the crust, the underlying rock may pass into a molten state.

If the earth had merely a solid crust, with a molten interior, it would be much pulled out of its spherical form, and probably broken up by the tidal attraction of the sun and moon. Sir William Thomson has shown that the globe as a whole is as rigid in form as if made of steel, and that consequently it may be considered as practically solid from centre to surface. It has, however, been plausibly suggested that, while the earth has a solid nucleus and a solid crust, there exists between these a liquid or viscous layer.

Various lines of argument, astronomical and physical, as well as purely geological, lend support to what is known as the *nebular theory*, according to which the sun, together with the earth and all the other planets of the solar system, once existed as a *nebula*, or cloud of stones resembling meteorites in an incandescent vapour. This nebula, radiating heat, would contract, throwing off portions as it condensed, which would cool into planets, the sun remaining incandescent in the centre of the system. In such condensation the heavier metallic

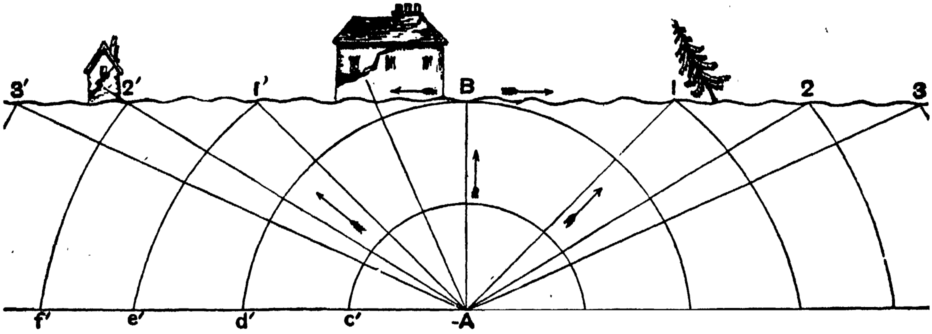


Fig. 86.—Earthquake Diagram.

substances might well collect towards the centre of the whole nebula, *i.e.*, the sun, or of any detached portion, *e.g.*, the earth. The internal heat of the earth being as great as it probably is, the central portion may consist not improbably of the heavy metals, although the density of the earth as a whole is, as we have seen, only 5·5. Metallic veins, which seem to have been cracks filled from below, support this opinion.

The flattening of the earth at the poles points to its once plastic condition; and it can be shown that at the present time the earth still parts with more heat than it receives from the sun. The first consolidation of the earth may have taken place at its surface; but, broken up by tidal action, the first-formed crust might, so long as the earth was liquid and convection-currents were possible, sink towards the centre. The solid nucleus would thus extend outwards until the exterior reached a viscous semi-solid state, in which conduction of heat replaced convection, when the permanently solid crust would begin to form inwards. During the cooling of the globe from its primitive to its present condition it has, no doubt, considerably contracted in size, and, though far less than it once was, this contraction is still going on. Composed as it is of various substances, this contraction in cooling will have been unequal, and a great amount of heat will undoubtedly be generated by the friction and crushing of the shrinking rock-masses. The great heat of the earth's interior may be the remainder of its original heat not yet radiated, or it may be wholly or in part due to shrinkage.

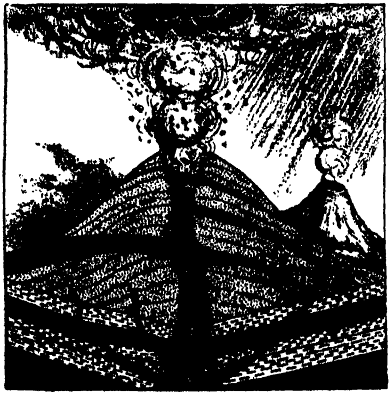


Fig. 87.—Section of a Volcano.

Origin of Mountain-axes.—As the central parts of the earth and the crust cooled unequally, the latter, in accommodating itself to the shrinking of the former, would probably be thrown into folds, as is the skin of an apple when its interior shrivels and loses water by evaporation. Such folds, which may well have been, roughly speaking, parallel to one another, may have been the origin of those ocean-troughs, lines of continental extension, and of axial mountain-chains, described in our last lesson; and our chief mountain-systems show abundant evidence that at several successive periods the rocks of which they are formed have been extensively crumpled into great parallel folds, with minor transverse plications, by pressure acting upon them in the main horizontally, or at a tangent to the earth's surface, such as would be produced by shrinkage from cooling. The upward arching of the rocks in such crumpling would relieve the pressure on the rock below the arch, and might thus allow it to become molten; and it is important to notice that when thus folded rocks are frequently unable to bear the strain, and are not only broken, but also extensively dislocated or *faulted*.

Earthquakes.—It can be shown by delicate instruments that the earth's surface is in a continual tremor, owing apparently to such causes as variations in atmospheric pressure or temperature, or in tidal attraction. Under more exceptional circumstances more violent tremors are observed, which may culminate in a violent shock, or *earthquake.* Earthquakes are especially frequent in the neighbourhood of volcanoes, and one or more shocks commonly precede a volcanic eruption. The effects of an earthquake are similar to those of a subterranean explosion. A violent vertical jerk is felt at some one point, known as the *epicentrum* (Fig. 36, B.), and then the shock is felt with diminishing intensity, and reaching the surface at gradually lessening angles at places more or less near to the epicentrum (Fig. 36, 1, 1′, 2, 2′, 3, 3′). The shock is, however, not a simple up and down movement, but is complicated by transverse vibrations, which give it a screwing effect, rotating chimney-stacks, for instance, on their axes. The absolute amount of movement of the ground is generally only a fraction of an inch; but this is not only sufficient to overthrow buildings, but also frequently produces landslips, or sliding of large rock-masses, subsidences, fissures, alteration of lines of drainage, and apparently extensive upheavals. The fissures have sometimes engulfed trees, houses, and human beings, and at other times have remained open, and have been subsequently widened by rain and streams into considerable ravines. The best recorded example of upheaval in connection with an earthquake is that of the Bay of Concepcion, in Chili, the coast of which was found by Admiral Fitzroy and Mr. Darwin, during the voyage of the *Beagle* in 1835, to have been raised to the extent of from four to ten feet, much of the elevation proving permanent. The greater part of the west coast of South America shows signs of having been elevated several hundred feet by such successive uplifts.

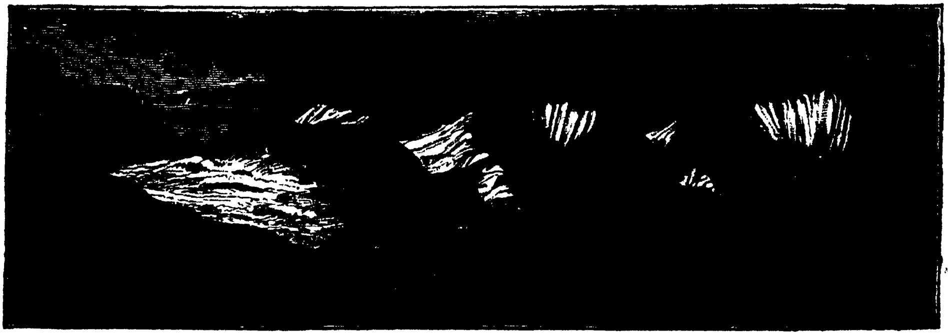


Fig. 38.—Extinct Volcanoes in the Puy de Dome Chain, France.

Fig. 39.—The White Terrace, Rotomahana, New Zealand (before the Eruption of June 10th, 1886).
(From a Photograph by Messrs. Burton, Bros.)

The earthquake is transmitted, undoubtedly, from its deep-seated origin, or *focus* (Fig. 36, A), in a series of more or less spherical waves of elastic compression (Fig. 36, *c'*, *d'*, *e'*, *f'*), reaching the surface consecutively in widening circular curves; but differences in the compactness of the rocks, large bodies of water, or ranges of hills, will vary the rate at which it travels. The shock travels more rapidly and to greater distances through the harder or more compact rocks, and seems liable to be intensified by reflection where it passes from one rock to another, or from land to water, or *vice versâ*. The earthquake is preceded or accompanied by a rumbling noise like thunder or cannon, and gives rise to a distinct atmospheric wave, and, if it originates under the sea, to a great and often most destructive sea-wave. A slight wave will travel with the earth-wave; but the main wave produced above the point of origin is slower, striking the coast some time after the earth-wave. This was the case at Lisbon, in November, 1755, and at Arica, in Peru, in August, 1868, and in May, 1877.

The area affected by earthquakes is very variable. That of Lisbon was felt over a region four times the area of Europe, the waters of Lake Ladoga and of Loch Lomond rising and falling, the spring at Luchon in the Pyrenees becoming permanently a warm one, and those at Bristol and at Töplitz being also affected. The Arica earthquake of 1868 was felt 2,000 miles off; but, on the other hand, destructive shocks on the islands of Casamicciola (in the Bay of Naples) and Scios (in the Archipelago) have been hardly perceptible on the neighbouring mainland.

The study of earthquakes is termed *seismology* (Greek, *σεισμὸς*, *seismos*, a shock), and accordingly the focus is termed the *seismic centre;* the line from it to the epicentrum (Fig. 36, A, B), the *seismic vertical;* points which receive the shock simultaneously, *co-seismic points;* the lines joining them, *co-seismic circles;* and instruments for recording the shocks, *seismographs* or *seismometers*.

The angle at which the main shock reaches the surface is termed the *angle of emergence* (*e.g.*, *the angle* A 2' B, Fig. 36); and it was until recently supposed that this angle might be obtained from the general direction of the main cracks in shattered buildings, which would run at right angles to the direction of the shock. The angle of emergence and the distance from the epicentrum being known, it would be a simple matter to calculate the length of the seismic vertical, or, in other words, the depth of the focus of origin of the earthquake; but the angles obtained from observations on cracks, and from instruments, have been so various that no conclusions can be drawn. It seems probable, however, that earthquakes seldom originate many miles beneath the surface.

As to the causes of earthquakes, there can be little doubt that the similarity of their effects at the surface has caused us to unite under one name phenomena of totally different origins. The falling-in of the roofs of subterranean caverns, such as occur in limestone rocks, might produce slight local earthquakes; but agencies suggested as likely to produce more widespread results are the snap of rocks under strain, the explosion of volcanic gases, or the sudden conversion of water into steam.

Volcanoes.—With reference to the last-mentioned of these suggested causes of earthquakes, it is noticeable (i.) that earthquakes are most frequent in volcanic districts; (ii.), that volcanoes commonly occur in mountain-chains, where, as has been already mentioned, it would seem probable that the relief from pressure of the subjacent rock, produced by crumpling, may enable it to become molten, it being already intensely heated; (iii.), that volcanoes are almost always near the sea; (iv.), that all rocks are to some extent porous; and (v.), that when the earthquake is followed by a volcanic eruption, steam is one of the first and most continuous substances thrown out.

Though the first formation of a *volcano* (Italian, *vulcano*, from Vulcan, the Roman god of fire) has seldom been witnessed, it would seem that it is marked by earthquake movements followed by the opening of a rent or fissure; but with no such tilting up of the rocks as was once supposed to take place. From this fissure large volumes of steam issue, accompanied by hydrogen, nitrogen, carbon dioxide, hydrochloric acid, and sulphur dioxide. The hydrogen, apparently derived from the dissociation of water at a high temperature, flashes explosively into union with atmospheric oxygen, and, having exerted its explosive force, the steam condenses into cloud, heavy masses of which overhang the volcano, pouring down copious rains. This naturally disturbs the electrical condition of the atmosphere, so that thunder and lightning are frequent accompaniments of an eruption. The hydrochloric acid probably points to the agency of sea-water. Besides the gases just mentioned, sulphuretted hydrogen, ammonia, and common salt occur; but mainly as secondary products, formed by the union of the vapours issuing from the volcano, and commonly seen also in the vapours rising from cooling lava-streams or dormant volcanic districts. It is important to notice that the vapours issue from the volcano spasmodically, explosions succeeding each other with great rapidity and noise (Fig. 37).

All substances thrown out by the volcano, whether gaseous, liquid, or solid, are conveniently united under the term *ejectamenta* (Latin, things thrown out), and all of them are in an intensely heated, if not in an incandescent state. Most of the gases are incombustible; but the hydrogen and those containing sulphur burn with a true flame rendered perhaps more visible by the presence of solid particles. Much of the so-called flame, however, in popular descriptions of eruptions is an error of observation due to the red-hot solid particles and the reflection of the glowing orifice on the overhanging clouds.

Solid bodies are thrown into the air with enormous force and to proportionally great heights, those not projected vertically falling in consequence at considerable distances from the volcano. A block weighing 200 tons is said to have been thrown nine miles by Cotopaxi; masses of rock weighing as much as twenty tons to have been ejected by Mount Ararat in 1840; and stones to have been hurled to a distance of thirty-six miles in other cases. The solid matter thrown out by volcanoes consists of lapilli, scoriæ, dust, and bombs. Though on the first formation of the volcano masses of non-volcanic rock may be torn from the chimney or pipe of the volcano, only slightly fused externally, owing to the bad conducting power of most rocks, and hurled to a distance; and though at the beginning of a subsequent eruption the solid plug of rock which has cooled at the bottom of the crater, or, in fact, any part of the volcano, may be similarly blown up, the bulk of the solid particles of which the volcano itself is composed is derived from the lake of *lava* or molten rock which seethes at the orifice. Solid pieces rent from this fused mass and cast up by the explosive force of the steam with which the lava is saturated are known as *lapilli.* Cooling rapidly so as to be glassy in texture externally, these often have time to become perfectly crystalline within. Gases and steam escaping from other similar masses may leave them hollow, when they are termed *bombs*, or may pit their surfaces with irregular bubble-cavities, when they are called *scoriæ* or *scoriaceous.* Such masses whirling through the air in a plastic state often become more or less oblately spheroidal in form; but, as often, the explosive force of their contained vapours shatters them into fragments, producing quantities of the finest *volcanic dust* or *sand.* This fine dust darkens the clouds overhanging the mountain, mixes with the condensed steam to fall as a black mud-rain, or *lava di æqua* (Italian, water lava), or is carried up to enormous heights, so being slowly diffused by upper currents of the atmosphere. In the eruption of Vesuvius, A.D. 79, the air was dark as midnight for twelve or fifteen miles round; the city of Pompeii was buried beneath a deposit of dry scoriæ, or ashes and dust, and Herculaneum, beneath a layer of the mud-like *lava di aqua*, which on drying sets into a compact rock. Rocks formed from these fragmentary volcanic materials are known as *tuff.* The brilliantly-coloured sunset effects which even in England lasted for some months after the great eruption of Krakatoa in the Sunda Straits in 1883, are attributed to the particles of dust from the volcano diffused through our atmosphere.

It is entirely of these cindery fragments heaped up with marvellous rapidity round the orifice that the volcano itself is first formed. It may, as in the case of Jorullo in Mexico in 1759, form a cone several hundred feet high in less than a day. Such a cone may have a slope as steep as 30° or 40°, its incline in all cases depending simply on the *angle of repose* of its materials, the inclination, that is, at which they stop rolling. The great volcanoes of the Andes, which are formed mainly of ash, are very steep. Owing to a general similarity in their materials volcanic cones in all parts of the world have a very similar curvature; but older volcanic mountains, in which lava-streams have broken through the cone, secondary cones have arisen, or portions have been blown up, are more irregular in outline and more gradual in inclination.

In size volcanoes vary from mere mounds a few yards in diameter, such as the *salses* or *mud-volcanoes* near the Caspian, to Etna, 10,800 feet high, with a base 30 miles in diameter; Cotopaxi, in the Andes, 18,887 feet high; or Mauna Loa, in the Sandwich Isles, 13,700 feet high, with a base 70 miles in diameter, and two craters, one of which, Kilauea, the largest active crater in our earth, is seven miles in circuit. Larger extinct craters occur in Japan; but all our terrestrial volcanic mountains are dwarfed by those observed on the surface of the moon, which, owing to its smaller size, has cooled more rapidly than our earth. It is, of course, the explosive force from below which keeps the *crater* (Greek, κρατὴρ, a punch-bowl) clear, as a cup-shaped hollow, truncating the cone; and all stones falling into it would only be thrown out again. It may at the close of an eruption cool down so completely that a lake may form within it, such as Lake Averno, near Naples; or it may long remain a seething sea of lava, such as Kilauea; or the lava may find one or more outlets from it, either by welling over its rim, which it will then generally break down, as in many of the small extinct volcanoes ("puys") of Auvergne (Fig. 38), or more usually by bursting through the sides of the cone.

It is not generally until the volcano has exhausted its first explosive force that lava begins to issue. Several streams may issue in different directions. Their dimensions are sometimes enormous. In 1783–5 Skaptar Jökul, in Iceland, poured out lava forty-five miles in one direction and fifty miles in another, spreading out locally fifteen miles in width, with a thickness of 100 feet increasing in valleys to 600, the total mass being computed as equal to the bulk of Mont Blanc. Lava varies very much in liquidity. and in the rate at which it flows. This much depends, however, upon the slope it has to traverse. A lava-stream at Vesuvius ran three miles in four minutes, but took three hours to flow the next three miles, whilst a stream from Mauna Loa ran eighteen miles in two hours. Glowing at first as a white-hot liquid, the lava soon cools at the surface to red and then to black; cinder-like scoriaceous masses form on its surface and in front of the slowly-advancing mass; clouds of steam and other vapour rise from it, and little cones are thrown up from its surface; but many years may elapse before the mass is cooled through. Thus while the surface is glassy, the interior becomes crystalline. The dark glass-like lava, abundant in Mexico, where the ancient inhabitants used it for knives, is known as *obsidian;* the froth or scum of the stream, filled with gas-cavities, as *pumice* (Latin, *pumex*, *spumex*, *spuma*, froth).

Sheets of lava, more or less vertical, injected from within through the mass of a volcano, and often of other rocks beyond, serve to bind it together, and to preserve it to some extent from denuding agencies. These sheets, when cooled, are known as *dykes.*

As the temperature of the volcano falls, hydrogen ceases to be given off, but nitrogen and carbon dioxide increase in quantity. *Fumaroles*, or smoking vents, both in the crater and on lava-streams, emit these gases, sometimes long after an eruption, together with alkaline compounds of soda, potash, lime, and sulphur, or, as the temperature falls, with acids. Fumaroles rich in sulphur, which they often deposit in crystals, are known as ***solfataras***, and in Tuscany jets, known as *soffioni*, give off steam and boracic acid, the heat of the former being economically employed to concentrate the latter. Bright-coloured chlorides, sulphate of lime, alum, and other minerals encrust the crater as it cools.

Geysers, and perhaps also mud-volcanoes, mark an area of diminishing volcanic energy. While the latter are found in various parts of the globe, geysers occur only in Iceland, New Zealand, and the Yellowstone Park. They are, in fact, water-volcanoes, springs issuing from deep fissures and periodically boiling over explosively. Their heated waters precipitate silica, forming craters and extensive sheets or terraces of the rock known as ***geyserite*** or ***sinter*** (Fig. 39).

FRENCH.—VII.

[Continued from Vol. I., p. 352.]

STEMS AND TERMINATIONS OF THE VERBS (*contd.*): PAST INDEFINITE.

THE past indefinite is composed of the present of the indicative of one of the auxiliary verbs, *avoir* or *être*, and the participle past of a verb. *Avoir* is used as an auxiliary with active verbs, *être* with passive and neuter verbs.

J'ai parle, je suis arrivé.	*I have spoken, I have arrived.*

The past indefinite is used to express an action entirely completed, but performed at a time of which a part is not yet elapsed, or at a time entirely past, but not specified.

J'ai vu votre père ce matin.	*I saw your father this morning.*
Je ne vous ai pas encore parlé.	*I have not yet spoken to you.*

The past indefinite may also be used when the time is specified.

Je lui ai écrit la semaine dernière.	*I wrote to him last week.*
Je lui ai envoyé une lettre le mois dernier.	*I sent him a letter last month.*

In this tense, and in other compound tenses, the adverb is generally placed between the auxiliary verb and the participle.

Vous nous avez souvent parlé.	*You have often spoken to us.*
Je ne l'ai pas encore vu.	*I have not yet seen him.*

The adverbs **aujourd'hui**, *to-day;* **demain**, *to-morrow;* **hier**, *yesterday;* polysyllabic adverbs of manner ending in *-ment*, and long adverbs generally, do not come between the auxiliary verb and the participle, but follow the participle.

Vous avez lu dernièrement.	*You read lately.*

The impersonal verb *y avoir*, placed before a word expressing time, corresponds with the English word *ago*.

J'ai reçu une lettre il y a huit jours.	*I received a letter eight days ago.*
Vous avez acheté une maison il y a un an.	*You bought a house a year ago.*

MISCELLANEOUS EXAMPLES.

Vos neveux nous ont parlé.	*Your nephews spoke to us.*
Nous avons parle à votre père.	*We spoke to your father.*
Le tailleur a-t-il porté mon habit?	*Has the tailor brought my coat?*
Le cordonnier a ôté ses souliers	*The shoemaker has taken his shoes off.*
Votre frère a dit quelque chose.	*Your brother said something.*
Qu'a dit votre sœur?	*What did your sister say?*
N'avez-vous rien dit à mon cousin?	*Have you told my cousin nothing?*
Je ne lui ai rien dit.	*I have told him nothing.*
Je ne l'ai jamais rencontré.	*I have never met him.*
Je ne leur ai jamais parlé.	*I never spoke to them.*
Qu'avez-vous fini aujourd'hui?	*What have you finished to-day?*
Hier nous n'avons pas travaillé	*We did not work yesterday.*
Leur en avez-vous souvent parlé?	*Have you often spoken to them about it?*
Je leur en ai souvent parlé.	*I have often spoken to them about it.*

N'avez-vous pas assez écrit?	***Have you not written enough?***
Il m'a écrit il y a longtemps	***He wrote to me a long time ago.***
Il nous a répondu il y a un mois.	***He replied to us a month ago.***

VOCABULARY.

Avocat, m. *barrister.*
Cela, ceci, *that, this.*
Dit, *from* dire, 4, *said, told.*
Écrit, *from* écrire, 4, *written.*
Étudi-er, 1, *to study.*
Fait, *from* faire, 4, *done.*
Gant, m. *glove.*
Garçon, m. *boy.*
Hier, *yesterday.*
Journée, f *day.*
Lu, *from* lire, 4, *read.*
Ministre, m. *minister.*
Mis, *from* mettre, 4, *put on.*
Plant-er, 1, *to plant.*
Poirier, m *pear-tree.*
Port-er, 1, *to carry, take.*
Prendre, 4, *to take.*
Soulier, m. *shoe.*
Vu, *from* voir, 3, *seen.*

The participles *dit, ecrit, lu, mis,* and *vu,* are from irregular verbs, the conjugation of which you will learn presently.

EXERCISE 41.

Translate into English :—

1. Qui vous a dit cela? 2. L'avocat me l'a dit. 3. Lui avez-vous parlé de cette affaire? 4. Je ne lui en ai pas encore parlé. 5. L'avez-vous vu dernièrement? 6. Je l'ai vu il y a quelques jours. 7. N'avez-vous pas travaillé hier? 8. Nous avons lu et travaillé toute la journée. 9. N'avez-vous pas ôté vos gants et vos souliers? 10. Je n'ai pas ôté mes gants, mais j'ai ôté mon chapeau. 11. Le tailleur n'a-t-il pas mis son chapeau? 12. Oui, Monsieur, il a mis son chapeau. 13. Qu'avez-vous parlé à ce petit garçon? 14. Je ne lui ai rien parlé. 15. Ne lui avez-vous point dit que je suis ici? 16. Je ne le lui ai pas encore dit. 17. Qu'avez-vous étudié ce matin? 18. Nous avons étudié nos leçons et nous avons lu nos livres. 19. Le jardinier du ministre a-t-il planté le poirier? 20. Il l'a planté il y a plus de huit jours. 21. Avez-vous acheté un habit de drap noir? 22. J'en ai acheté un. 23. L'avez-vous porté aujourd'hui? 24. Je ne l'ai pas encore porté. 25. Nous avons mis nos souliers et nos bas ce matin.

EXERCISE 42.

Translate into French :—

1. Have you studied to-day? 2. We have no time to study; we have read a page. 3. Have you not written to my brother? 4. I have not yet written to him. 5. Has not the German written to my mother? 6. He has not yet written to her. 7. Have you told (*à*) my mother that I have taken this book? 8. I have not yet seen your mother. 9. What have you done this morning? 10. We have done nothing. 11. Have you taken off your coat? 12. I have not taken off my coat, it is too cold. 13. Has the bookseller written to your brother? 14. He wrote to him a long time ago. 15. Did he write to him a month ago? 16. He wrote to him more than a year ago. 17. Have you planted a pear-tree? 18. We have planted several. 19. Is it too cold to (*pour*) plant trees? 20. It is too warm. 21. What has the gardener done to your little boy? 22. He has done nothing to him. 23. Has anyone done anything to him? 24. No one has done anything to him. 25. Is anything the matter with him. 26. Nothing is the matter with him. 27. Has your father put on his black hat? 28. No, Sir, he has not put on his black hat. 29. What has your brother said? 30. He has said nothing. 31. Has your sister told you that? 32. She told it me. 33. Did you not work yesterday? 34. We did not work yesterday, we had nothing to do. 35. Your little boy has not studied to-day.

PAST PARTICIPLE.

The past participle, which in French forms a part of every compound tense, is susceptible of changes in its termination.

The feminine of past participles is formed by adding *e* mute to the masculine.

The plural of a past participle is formed by adding *s* to the singular, masculine or feminine. When the participle itself ends in *s*, the masculine is the same in singular and plural.

The past participle, accompanied by the auxiliary verb *avoir*, never agrees with the nominative or subject.

Les demoiselles ont chanté.	*The young ladies sang.*
Ces messieurs ont lu toute la journee	*Those gentlemen read the whole day.*

The past participle, having *être* as its auxiliary verb, agrees in gender and number with the subject.*

Ma fille est arrivée ce matin.	*My daughter arrived this morning.*
Nos freres ne sont pas venus.	*Our brothers are not come*

The past participle, accompanied by the auxiliary verb *avoir*, agrees in gender and number with its direct object, when that object *precedes* the auxiliary.

Les dames que nous avons vues.	*The ladies whom we have seen.*
Les lettres que nous avons lues.	*The letters which we have read.*

When the direct object (accusative) follows the participle, no agreement takes place.

Avez-vous vu les dames?	*Have you seen the ladies?*
Avons-nous lu les lettres?	*Have we read the letters?*

A past participle never agrees with its indirect object.

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* When *vous* is used as subject in addressing *one* person, although it is placed with a verb in the second person plural, as in English, yet it requires its adjective or past participle to be in the singular. Thus: **vous êtes aimé** (*you are loved*) indicates, by the past participle being in the singular, that one person only is referred to; whilst *vous êtes aimés*, with the past participle in the plural, points out that *vous* refers to several people.

The pronouns of the first and second persons, singular and plural, are common gender, and therefore the adjective or past participle in agreement with them is in the masculine or in the feminine, according to the gender of the noun to which they refer.

Les dames à qui nous avons parlé.	*The ladies to whom we have spoken.*

The past participle used adjectively, that is, without an auxiliary verb, follows the rule of the adjective.

Des livres bien imprimés.	*Well-printed books.*

The past participle, having for object the relative pronoun *en*, remains invariable.

Avez-vous apporté des plumes?	*Have you brought pens?*
J'en ai apporté.	*I have brought some.*

The presence of *en* does not, however, prevent the agreement of the participle, when it is preceded by a direct object.

Les plumes que j'en ai apportées	*The pens which I have brought from it.*

The above rules are of the greatest importance to the student of French, and as they exhibit striking differences from the English usage, they should be learnt with the utmost care.

MISCELLANEOUS EXAMPLES.

Vos sœurs ont-elles écrit?	*Have your sisters written?*
Elles n'ont pas encore ecrit?	*They have not yet written.*
Les lettres que nous avons écrites.	*The letters which we have written.*
Avez-vous écrit vos lettres?	*Have you written your letters?*
Je les ai lues, je les ai écrites.	*I have read them, I have written them.*
Les avez-vous apportées?	*Have you brought them?*
Je ne les ai pas apportées.	*I have not brought them.*
Avez-vous appele ces dames?	*Have you called those ladies?*
Je ne les ai pas appelées.	*I have not called them.*
Qui avez-vous vu ce matin?	*Whom have you seen this morning?*
Nous avons vu ces demoiselles.	*We have seen those young ladies.*
Nous les avons vues.	*We have seen them.*
Nous ne leur avons pas parlé.	*We have not spoken to them.*
Avez-vous des livres relies?	*Have you any bound books?*
J'ai des livres broches.	*I have unbound (stitched, in paper covers) books.*
Avez-vous acheté des pommes?	*Have you bought apples?*
J'en ai acheté.	*I have bought some.*
Nous en avons acheté.	*We have bought some.*
Nous les en avons persuadés.	*We have persuaded them of it.*

VOCABULARY.

Achet-er, 1, *to buy.*
Appel-er, 1, *to call.*
Apport-er, 1, *to bring.*
Bourse, f. *purse.*
Broch-er, 1, *to stitch.*
Cass-er, 1, *to break.*
Commission, f. *errand.*
Entend-re, 4, *to hear.*
Examin-er, 1, *to examine.*
Exprès, *on purpose.*
Fleur, f. *flower.*
Gravure, f. *engraving.*
Laiss-er, 1, *to leave.*
Nouvelle, f. *news.*
Oubli-er, 1, *to forget.*
Reli-er, 1, *to bind.*
Revenus, m. p. *income.*
Tasse, f. *cup.*

EXERCISE 43.

Translate into English :—

1. Nous avez-vous apporté nos habits? 2. Nous ne les avons pas encore apportés. 3. Les avez-vous oubliés? 4. Nous ne les avons pas oubliés, mais nous n'avons pas eu le temps de les apporter. 5. Pourquoi n'avez-vous pas appelé les marchands? 6. Je les ai appelés, mais ils ne m'ont pas entendu. 7. Avez-vous entendu cette musique? 8. Je l'ai entendue. 9. N'avez-vous pas vu les jolies fleurs que j'ai apportées? 10. Je les ai vues; à qui les avez-vous données? 11. Je ne les ai données à personne, je les ai gardées pour vous. 12. Avez-vous bien examiné ces gravures? 13. Je les ai bien examinées. 14. Les avez-vous achetées? 15. Je ne les ai point achetées. 16. N'avez-vous point reçu vos revenus? 17. Je ne les ai point encore reçus. 18. La domestique a-t-elle cassé ces tasses? 19. Elle les a cassées. 20. A-t-elle cassé des tasses exprès? 21. Elle n'en a pas cassé exprès. 22. Avez-vous acheté des livres reliés ou brochés? 23. J'ai acheté des livres reliés. 24. Nous avez-vous dit ces paroles? 25. Nous vous les avons dites, mais vous les avez oubliées. 26. Je n'ai pas oublié votre commission.

EXERCISE 44.

Translate into French :—

1. Have you seen my cups? 2. I have not yet seen them. 3. Have you brought me my books? 4. I have not forgotten them, I have left them at my brother's. 5. Has your mother called your sisters? 6. She has not yet called them. 7. Has the servant told you this news? 8. She has told me this news. 9. She has told it me. 10. Have you forgotten my errand? 11. We have not forgotten it, we have forgotten your money. 12. Where have you left your purse? 13. We left it at the merchant's. 14. Have you bought the beautiful engravings which I saw at your bookseller's? 15. I have not seen them. 16. Has your mother bought them? 17. She has bought books, but she has bought no engravings. 18. Has that little girl broken my cups? 19. She has broken them on purpose. 20. Does that lady receive her income every month? 21. She receives it every six months. 22. Is the house which you have bought large? 23. I have bought no house. 24. Did you receive a letter from your father yesterday? 25. I received a letter from him four days ago. 26. Have you spoken to those ladies? 27. I have spoken to them. 28. Have you given them flowers? 29. I have given them some. 30. Are the books which you have bought bound? 31. No, Sir, they are in paper covers. 32. Have you examined that house? 33. I have not examined it. 34. Your brother has examined several.

PAST DEFINITE.

The past definite may be called the narrative or historical tense of the French. It is used to express an action entirely past, definite and complete in itself. The time may or may not be specified, but it must have elapsed before the statement is made.

Je parlai hier a votre frère.	*I spoke to your brother yesterday.*
Vous chantâtes bien l'année dernière.	*You sang well last year.*
Mon frère partit hier pour Paris.	*My brother left yesterday for Paris.*

The student will bear in mind that the past indefinite may be used for the past definite. The past definite, however, may never be used for the indefinite. In conversation the indefinite is preferred to the definite, as the latter would appear too formal.

The past definite may generally be rendered in English by the perfect. The past definite can never be rendered in English by the present participle of the verb preceded by *was*.

J'allai à l'église hier matin.	*I went to church yesterday morning.*

TERMINATIONS OF THE PAST DEFINITE OF THE FOUR CONJUGATIONS.

Je	chant *-ai* *sang*	fin *-is* *finished*	reç *-us* *received*	rend *-is.* *rendered.*
Tu	parl *-as* *spokest*	chér *-is* *cherishedst*	aperç *-us* *perceivedst*	vend *-is.* *soldest.*
Il	donn *-a* *gave*	fourn *-it* *furnished*	perç *-ut* *collected*	tend *-it.* *tended.*
Nous	cherch *-âmes* *sought*	pun *-îmes* *punished*	conç *-ûmes* *conceived*	entend *-îmes.* *heard.*
Vous	port *-âtes* *carried*	sais *-îtes* *seized*	d *-ûtes* *owed*	perd *-îtes.* *lost.*
Ils	aim *-èrent* *loved, liked*	un *-irent* *united*	déç *-urent* *deceived*	mord *-irent.* *bit.*

It will be seen that the terminations of the second and fourth conjugations are alike.

MISCELLANEOUS EXAMPLES.

On nous parla de vous hier.	*They spoke to us of you yesterday.*
Le banquier nous donna de l'argent l'année dernière.	*The banker gave us money last year.*
Le banquier nous a donné de l'argent.	*The banker has given us money.*
Le professeur nous parla de vous l'année dernière	*The professor spoke to us about you last year.*
Il nous a parlé de ses amis et des nôtres.	*He spoke to us of his friends and of ours.*
Pendant notre voyage, il nous raconta ses aventures.	*During our journey he related to us his adventures.*
Il nous a raconté l'histoire de sa vie.	*He related to us the history of his life.*

VOCABULARY.

Aîné, -e, *elder, eldest.*
Avec, *with.*
Derni-er, -ère, *last.*
Habillement, m. *dress.*
Lorsque, *when.*
Neuf, -ve, *new.*
Ordinairement, *generally.*
Pendant, *during.*
Pri-er, 1, *to beg.*
Propriétés, f. p. *property.*
Remerci-er, 1, *to thank.*
Séjour, m. *stay.*
Semaine, f. *week.*
Soldat, m. *soldier.*
Tard, *late.*
Trop tôt, *too soon.*

EXERCISE 45.

Translate into English :—

1. Le banquier reçut-il beaucoup d'argent la semaine dernière? 2. Il en reçut beaucoup. 3. Aussitôt que vous aperçûtes votre frère, ne lui parlâtes-vous pas? 4. Dès que je l'aperçus, je lui parlai. 5. Avez-vous déjà porté vos habillements neufs? 6. Je ne les ai pas encore portés. 7. Quand il vous donna de l'argent hier, le remerciâtes-vous? 8. Je le remerciai et je le priai de vous remercier. 9. Avez-vous trouvé vos livres? 10. Je ne les ai pas encore trouvés. 11. Lorsque vous vîntes (*came*) nous voir ne finîtes-vous pas vos affaires avec mon père? 12. Je les finis alors et je le payai. 13. N'avez-vous pas vu votre sœur aînée pendant votre séjour à Lyon? 14. Je ne l'ai pas vue. 15. Ne cherchâtes-vous pas à vous échapper de votre prison l'année dernière? 16. Je n'ai jamais cherché à m'échapper. 17. Avez-vous vendu vos propriétés? 18. Je ne les ai pas vendues. 19. Qu'avez-vous donné au soldat? 20. Je ne lui ai rien donné. 21. Pendant son séjour à B., nous lui donnâmes tout ce qu'il voulut.

EXERCISE 46.

Translate into French :—

1. What did you receive last week? 2. We received fifty francs from your friend, and twenty-five from your brother. 3. Did you take your son to church with you yesterday? 4. I did not take him there. 5. What did you lose last year? 6. We lost our money, our clothes, and our horses. 7. Have you looked for them? 8. I looked for them, but did not find them. 9. Did they speak of your brother yesterday? 10. They spoke of him and of you. 11. What did the physician give you? 12. He gave me nothing. 13. Has your cousin sold all his property? 14. He has not sold it, he has given it to his eldest sister. 15. Has the traveller related his adventures to you? 16. He related them to me. 17. Did that man try to speak to your father? 18. He tried to speak to him. 19. Did the professor speak of your brother during his stay at your house? 20. He spoke of him. 21. Has your friend worn his new coat? 22. He has not worn it yet. 23. Have you thanked your brother? 24. I have thanked him. 25. What have you given to your eldest sister? 26. I have given her nothing, I have nothing to give her. 27. When your brother gave you a book last year, did you thank him? 28. I did not thank him.

IMPERFECT.

The imperfect tense may be called the descriptive tense of the French. The action which it represents, or the situation which it describes, is imperfect or unfinished of itself. The tense leaves the beginning, duration, and end of an action undetermined. It may often be rendered by the English imperfect, which is formed by the past tense of *to be* and the present participle of the leading verb.

Je parlais ce matin quand vous êtes entré.	*I was talking this morning when you came in.*
Je passais hier quand elle m'a appelé.	*I was passing yesterday when she called me.*

The imperfect is also used to express an action which is customary or often repeated. It may then be rendered in English by the word *used* placed before the infinitive of the leading verb.

L'année dernière j'allais tous les jours à l'école.	*Last year I went (used to go) every day to school.*
Quand nous demeurions à la campagne, nous étudions toute la journée.	*When we were (used to be) in the country, we used to study all day.*

The imperfect can seldom be rendered in English by the past tense which takes *did** as an auxiliary. The past definite on the other hand never corresponds in meaning to the English imperfect composed of the past tense of *to be* and the participle present. Nor can it ever be rendered by the infinitive of the leading verb preceded by *used.*

J'allais à la chasse hier matin quand nous nous rencontrâmes.	*I was going a-hunting yesterday morning when we met.*
J'allai à la chasse hier matin.	*I went a-hunting yesterday morning.*

The imperfect may be formed from the participle present, by changing *ant* into *ais*, etc.

TERMINATIONS OF THE IMPERFECT TENSE OF THE FOUR CONJUGATIONS.

Je	chant *-ais*	fin *-issais*	recev *-ais*	rend *-ais.*
I	*was singing*	*was finishing*	*was receiving*	*was rendering*
Tu	parl *-ais*	chér *-issais*	apercev *-ais*	vend *-ais.*
Thou	*wast speaking*	*wast cherishing*	*wast perceiving*	*wast selling.*
Il	donn *-ait*	fourn *-issait*	percev *-ait*	tend *-ait.*
He	*was giving*	*was furnishing*	*was collecting*	*was tending.*
Nous	cherch*-ions*	pun *-issions*	concev *-ions*	entend*-ions.*
We	*were seeking*	*were punishing*	*were conceiving*	*were hearing.*
Vous	port *-iez*	sais *-issiez*	dev *-iez*	perd *-iez.*
You	*were carrying*	*were seizing*	*were owing*	*were losing.*
Ils	aim *-aient*	un *issaient*	décev *-aient*	mord *-aient.*
They	*were loving*	*were uniting*	*were deceiving*	*were biting.*

MISCELLANEOUS EXAMPLES.

Je chantais quand on m'apporta votre lettre.	*I was singing when they brought me your letter.*
J'aimais autrefois à lire les poètes anglais.	*I used to like formerly to read the English poets.*
J'étais dans votre chambre lorsque vous êtes entré.	*I was in your room when you came in.*
Je parlai hier toute la matinée.	*I spoke yesterday the whole morning.*
Je parlais hier à votre père, lorsque votre ami nous rencontra.	*I was speaking to your father when your friend met us yesterday.*
Je cherchais votre père.	*I was looking for your father.*

VOCABULARY.

Autrefois, *formerly.*
Brun, -e, *brown.*
Chambre, f. *room.*
Crayon, m. *pencil.*
Demeur-er, 1, *to live, dwell.*
De nouveau, *again.*
Écolier, m. *scholar.*
Mérit-er, 1, *to deserve.*
Noir, -e, *black.*
Pantoufle, f. *slipper.*
Parchemin, m. *parchment.*
Presque pas, *almost none.*
Retrouv-er, 1, *to find again.*
Thème, m. *exercise.*
Vert, -e, *green.*

EXERCISE 47.

Translate into English :—

1. De qui parliez-vous ce matin quand je vous ai trouvé ? 2. Ma cousine parlait de son frère et je parlais du mien. 3. N'aimiez-vous pas mieux le bœuf que le mouton, autrefois ? 4. J'aimais le bœuf, mais je n'ai jamais aimé le mouton. 5. Ne vendiez-vous pas beaucoup de livres, lorsque vous demeuriez à Paris ? 6. J'en vendais beaucoup, parce que j'étais libraire. 7. Le libraire a-t-il vendu beaucoup de crayons ce matin ? 8. Il a vendu beaucoup de crayons aujourd'hui. 9. Vendiez-vous beaucoup de parchemin lorsque vous étiez libraire ? 10. Je n'en vendais presque pas. 11. Votre frère portait-il un habit vert lorsqu'il demeurait à Londres ? 12. Il portait un habit brun et des pantoufles noires. 13. Que cherchiez-vous ? 14. Je cherchais mon livre. 15. Depuis quand l'aviez-vous perdu ? 16. Je l'avais perdu depuis hier. 17. L'avez-vous retrouvé ? 18. Je l'avais retrouvé, mais je l'ai perdu de nouveau. 19. Ce boulanger vous fournissait-il de bon pain ? 20. Il nous en fournissait d'excellent. 21. Punissiez-vous souvent vos écoliers ? 22. Je les punissais quand ils le méritaient. 23. Où étiez-vous ce matin quand je vous cherchais ? 24. J'étais dans ma chambre. 25. Je finissais mon thème.

EXERCISE 48.

Translate into French :—

1. Who was at your house this morning ? 2. My friend G. was there, and was looking for you. 3. Did you speak to my father yesterday ? 4. I was speaking to him when they brought me your letter. 5. Used your father to wear a white hat when he lived in London ? 6. He used to wear a black hat. 7. Were you singing when my father came ? 8. No, I was finishing my exercise. 9. Had you lost your pencil this morning ? 10. I had lost it, and was looking for it when you spoke to me. 11. You used to like reading (*la lecture*), did your sister (use to) like it also ? 12. She liked it also. 13. What song were you singing this morning ? 14. I was singing an Italian song. 15. Have you been afraid to speak to me ? 16. I have never been afraid to speak to you. 17. Have you brought my book ? 18. I have not brought it.

PLUPERFECT AND PAST ANTERIOR.

The pluperfect is composed of the imperfect of the auxiliary, and of the past participle of the leading verb : **j'avais parlé**, *I had spoken ;* **j'étais venu**, *I had come.*

This tense describes an action or situation which took place before another, but *without depending upon it* :—

J'avais déjeûné quand il entra.	*I had breakfasted when he came in.*

It is also used to express a habit, an act often repeated, if it used to take place before or after another :—

Dès que j'avais fini ma tâche, je parlais à mon ami.	*As soon as I had finished my task, I used to speak to my friend.*

Finally, it is employed to represent an action entirely completed, which took place at a time which has elapsed, and, in this sense, is the equivalent of the corresponding English tense :—

---

* Except when, in interrogative sentences, *did* is employed instead of *used*, expressed or understood.

J'avais désiré voyager.	*I had desired to travel.*

The *past anterior* is formed from the past definite of the auxiliary, and the past participle of the leading verb : **J eus parlé**, *I had spoken :* **je fus tombé**, *I had fallen.*

The past anterior expresses generally a momentary action, which took place before another action. The latter immediately follows the former, and *depends upon it.* The action expressed by this tense is not a customary one. The past anterior is often preceded by **à peine**, *scarcely ;* **dès que**, **aussitôt que**, *as soon as ;* **quand**, **lorsque**, *when.*

Dès que j'eus fini ma tâche, je fus heureux.	*As soon as I had finished my task, I was happy.*

MISCELLANEOUS EXAMPLES.

Aviez-vous eu soin de vos effets?	*Had you taken care of your things?*
J'en avais eu soin.	*I had taken care of them.*
N'aviez-vous pas eu besoin de moi?	*Had you not wanted me?*
J'avais eu besoin de vous et de votre frère.	*I had wanted you and your brother.*
N'aviez-vous pas eu l'intention de me parler?	*Had you not intended to speak to me?*
Dès que vous eûtes fini votre lettre, ne la portates-vous pas à la poste?	*As soon as you had finished your letter, did you not carry it to the post-office?*
Dés que vous aviez fini vos lettres, ne les portiez-vous pas à la poste?	*As soon as your letters were finished, did you not take them to the post-office?*
Dés que vous fûtes arrivé, ne commençâtes-vous pas à écrire?	*As soon as you had arrived, did you not commence writing?*
Dès que vous étiez arrivé, ne commençiez-vous pas a écrire?	*As soon as you used to arrive, did you not commence writing?*

VOCABULARY.

Arrêt-er, 1, *to stop.*
Bal, m. *ball.*
Bourse, f. *purse.*
Clef, m. *key.*
Dangereusement, *dangerously.*
Diner, m. *dinner.*
Égar-er, 1, *to mislay.*

Invit-er, 1, *to invite.*
Malade, *ill.*
Musicien, m. *musician.*
Part-ir, 2, *to set out.*
Remont-er, 1, *to wind up.*
Sort-ir, 2, ir. *to go out.*
Spectacle, m. *play.*

EXERCISE 49.

Translate into English :—

1. Ne saviez-vous pas où le musicien était allé ? 2. Je savais qu'il était allé à Paris ? 3. Ne vous avait-on pas dit que votre frère était mort ? 4. On m'avait dit qu'il était dangereusement malade. 5. Ne sortiez-vous pas ordinairement dès que vous aviez fini vos leçons ? 6. Dès que je les avais finies, j'étais heureux. 7. Dès que vous eûtes fini vos leçons, à qui parlâtes-vous hier au soir ? 8. Aussitôt que je les eus finies, je parlai à votre frère. 9. Cette petite fille n'avait-elle pas envie de dormir ? 10. Elle avait plus envie de dormir que d'étudier. 11. Où aviez-vous mis votre livre quand je vous le demandai ? 12. Je l'avais égaré ? 13. Je l'avais oublié dans le jardin. 14. Pourquoi votre montre était-elle arrêtée ? 15. Parce que j'avais oublié de la remonter ? 16. L'horloger ne l'avait-il pas remontée ? 17. Il avait oublié de la faire ? 18. N'aviez-vous pas perdu votre bourse ? 19. Je l'avais perdue, mais je l'ai retrouvée. 20. Votre cousin était-il parti ? 21. Il n'était pas encore parti. 22. Était-il sorti ? 23. Il était sorti avec ma mère.

EXERCISE 50.

Translate into French :—

1. Had you not intended to speak to my brother ? 2. I had intended to speak to him, but he was gone out. 3. Did your sister go out last evening as soon as she had read her book ? 4. She went out as soon as she had read it. 5. Were you told that your sister was ill ? 6. I was told that she had been dangerously ill. 7. Did you know where you had put your pen ? 8. I knew that I had mislaid it. 9. How many of your books have you mislaid ? 10. I had mislaid five, but my brother has found them. 11. Where had you left them ? 12. I had left them in the garden. 13. Was your brother's watch stopped ? 14. It was stopped. 15. Why was it stopped ? 16. He had forgotten to wind it up. 17. Had he not lost his key ? 18. He had not lost it. 19. Was the dyer gone out ? 20. He was not yet gone out, he intended to leave at five. 21. Had you spoken to him when I came yesterday ? 22. I had spoken to him. 23. Had you told him that my sister is here ? 24. I had told him. 25. Is he still here ? 26. No, he is gone out, he went out this morning at six.

KEY TO EXERCISES.

Ex. 39.—1. Does your mother like reading? 2. Yes, Miss, she likes it much better than her sister. 3 What hat does your nephew wear? 4. He wears a silk hat, and I wear a straw hat. 5. Does that lady love her children? 6. Yes, Sir, she cherishes them. 7. Do you furnish those merchants with goods? 8. I furnish those merchants with goods, and they give me money. 9. Do your companions like fine clothes? 10. Our companions like fine clothes and good books. 11. Are you looking for my brother? 12. Yes, Sir, I am looking for him, but I do not find him. 13. Does your brother lose his time? 14. He loses his time and money. 15. Do we always lose our time? 16. We lose it very often. 17. Do you owe much money? 18. I owe enough, but I do not owe much. 19. Do you sell your two houses to our physician? 20. I sell only one, I keep the other for my sister-in-law. 21. Do you receive money to-day? 22. We receive but little. 23. Does your joiner finish his work early? 24. He finishes it late. 25. At what hour does he finish it? 26. He finishes it at half-past twelve. 27. We finish ours at twenty minutes to ten.

Ex. 40. -1. Votre compagnon aime-t-il la lecture? 2. Mon compagnon n'aime pas la lecture. 3. Votre père aime-t-il les bons livres? 4. Il aime les bons livres et les bons habits. 5. Devez-vous plus de vingt livres? 6. Je n'en dois que dix, mais mon frère en doit plus de quinze. 7. Avez-vous tort de finir votre travail de bonne heure? 8. J'ai raison de finir le mien de bonne heure, et vous avez tort de ne pas finir le vôtre. 9. Recevez-vous beaucoup d'argent aujourd'hui? 10. Je n'en reçois guère. 11. Donnons-nous nos meilleurs livres à ce petit enfant? 12. Nous ne les donnons pas, nous les gardons parce que nous en avons besoin. 13. Vendez-vous vos deux chevaux? 14. Nous ne vendons pas nos deux chevaux, nous en gardons un. 15. Finissez-vous votre travail ce matin? 16. Oui, Monsieur, je le finis ce matin de bonne heure. 17. Votre beau-frère aime-t-il les beaux habits. 18. Oui, Madame, il aime les beaux habits. 19. Cherchez-vous mon neveu? 20. Oui, Monsieur, nous le cherchons. 21. Perd-il son temps? 22. Il perd non-seulement son temps, mais il perd son argent. 23. Combien d'argent a-t-il perdu aujourd'hui? 24. Il a perdu plus de dix livres. 25. Votre menuisier finit-il votre maison? 26. Il finit ma maison et celle de mon frère.

ARITHMETIC.—VII.

[*Continued from Vol. I., p. 364.*]

SQUARE AND CUBE ROOT.

1. We have already stated that when any number is multiplied by itself any number of times, the products are called the second, third, fourth *powers*, etc., of the number respectively.

The second and third powers of any number are generally called the *square* and *cube* of that number. Thus, 81 is the square of 9, 27 is the cube of 3.

Any power of a number is expressed by writing the number of the power in small figures above the number, a little to the right.

Thus, the square of 9 would be written 9^2; the cube of 3, 3^3; the fifth power of 7, 7^5; and so on.

Conversely, the number which, taken twice as a factor, will produce a given number, is called the *square root* of that number; that which, taken three times as a factor, will produce a given number, is called the *cube root* of it; that which, taken four times as a factor, will produce a given number, is called the *fourth root* of it; and so on.

Any root of a number is represented by writing the sign $\sqrt{\ }$ over the number, and placing the number corresponding to the number of the root on the left of the symbol, thus: $\sqrt[3]{8}$ indicates the cube root of 8, $\sqrt[4]{81}$ the fourth root of 81.

The square root of a number is generally expressed by merely writing the symbol $\sqrt{\ }$ over the number, without the figure 2. Thus, $\sqrt{3}$ means the square root of 3; $\sqrt{84}$ the square root of 84.

2. Every number has manifestly a 2nd, 3rd, 4th, etc., *power*. But every number has not conversely an exact square, cube, third *root*. For example, there is no whole number which, when multiplied into itself, will produce 7; and since any fraction in its lowest terms multiplied into itself must produce a fraction, 7 cannot have a fraction for its square root. Hence 7 has no *exact* square root. But although we cannot find a whole number or fraction which, when multiplied into itself, will produce 7 exactly, we can always, as will be shown hereafter, find a decimal which will be a very near approximation to a square root of 7, and we can carry the approximation as nearly to $\sqrt{7}$ as we please. And the same will be true of every number which has no exact square root, third root, etc.

It is desirable that the student should know by heart the squares and cubes of the successive numbers from 1 up to 12, appended in the following table:—

NO.	SQUARE.	CUBE.	NO.	SQUARE.	CUBE.
1	1	1	7	49	343
2	4	8	8	64	512
3	9	27	9	81	729
4	16	64	10	100	1000
5	25	125	11	121	1331
6	36	216	12	144	1728

In finding the square of any number which is not very large—under 100 say—the following method will be found useful:—

3. *Short Method for finding the Square of a Number.*

Add and subtract from the number its defect or excess from the nearest multiple of 10. Multiply the numbers so found together, and add the square of the defect or excess.

For instance, to find the square of 97:—

100 is the nearest multiple of 10, and 3 is the defect of 97 from it.

$$97 + 3 = 100$$
$$97 - 3 = 94$$
$$3^2 = 9.$$

Therefore the required square of 97 is $100 \times 94 + 9. = 9409$.

Again, to square 44:—

40 is the nearest multiple of 10 to 44, and 4 is the excess of 44 over it.

$$44 + 4 = 48$$
$$44 - 4 = 40$$
$$4^2 = 16.$$

Hence the required square is $1920 + 16$, or 1936.

This operation can be readily performed mentally, as will be found by a little practice.

4. Observe, also, that no square number can end in 2, 3, 7, or 8; but that a cube can terminate in any one of the 10 figures. A number which has an exact square root is sometimes called a perfect square.

EXERCISE 48.

(1) Square the following numbers by a method of Art. 3: 17, 23, 57, 45, 68, 79, 93, 103, 107.

(2) Take any two numbers, and prove that the difference of their squares is equal to the product of their sum and difference.

(3) Take any two numbers, and prove that the difference of their cubes divided by their difference

is equal to the sum of their squares and their product.

(4) Take any two numbers, and prove that their product is equal to the square of half their sum *minus* the square of half their difference.

5. *Extraction of the Square Root.*

The square root of any given whole number or decimal can be obtained, or extracted, as is sometimes said, by means of the following rule, which we give without proof, as it requires the aid of algebra to establish it satisfactorily :—

Rule for the Extraction of the Square Root of any number.

Separate the given number into periods containing two figures each, by placing a point over the unit's figure, and also over every second figure towards the left in whole numbers, but both towards the left and the right in decimals.

Subtract from the extreme left-hand period the greatest square which is contained in it, and put down its square root for the first figure of the required whole square root. To the right of the remainder bring down the next period for a dividend. Double the part of the square root already found, and place it on the left of this dividend for a partial divisor; find how many times it is contained in the dividend, omitting its right-hand figure, and annex this quotient to the part of the root already obtained, and also to the partial divisor. Multiply the diviser thus formed by the last figure of the root, and subtract the product from the dividend, bringing down the next period to the right of the remainder for a dividend. Continue the operation until all the periods have been brought down. If the original number be a decimal, the process above indicated must be performed as if it were a whole number, and a number of decimal places cut off from the root so obtained, equal to the number of points placed over the *decimal part* of the original number.

6. The process will be best followed by means of examples.

EXAMPLE 1.—Find the square root of 627264.

The greatest square in the first period 62 is the square of 7, or 49. Subtracting 49 from 62, we place 7 as the first figure of the root. We bring down the next period 72 to the right of the remainder 13, for a dividend, doubling 7 to form a partial divisor, which is contained in 137 (the dividend without the right-hand figure 2) 9 times. We annex the 9 both to the partial divisor and to the part of the root already obtained. Multiplying 149 by 9, we subtract the product 1341 from the dividend, and bring down the next period, 64, to the right of the remainder for a dividend, doubling 79, the part of the root already obtained, for a partial divisor. 158 is contained 2 times in 316, and annexing the 2 both to the partial divisor 158 and to 79, the part of the root already obtained, we multiply the divisor 1582 by this last figure of the root; the produce is 3164, which, subtracted from the dividend, leaves no remainder. Hence 792 is the exact square root of 627264.

$$\begin{array}{rl}
 & 6\dot{2}7\dot{2}6\dot{4}\ (792 \\
 & 49 \\ \hline
149) & 1372 \\
 & 1341 \\ \hline
1582) & 3164 \\
 & 3164 \\ \hline
 & \ldots.
\end{array}$$

EXAMPLE 2.—Find the square root of 7·3441.

Placing a dot over the figure in the unit's place, we put one over every second figure to the right, and then, performing the operation as if 73441 were a whole number, as indicated in the margin, we get 271 as the root. We cut off two decimal places from this, because there are two dots over the decimal part of the original decimal.

The square root is therefore 2·71.

$$\begin{array}{rl}
 & \dot{7}\cdot3\dot{4}4\dot{1}\ (271 \\
 & 4 \\ \hline
47) & 334 \\
 & 329 \\ \hline
541) & 541 \\
 & 541 \\ \hline
 & \ldots
\end{array}$$

Obs.—At any stage of the process, the product of the completed divisor into the last figure of the root must not exceed the dividend. Hence, in finding the figure to be placed in the root, care must be taken to observe whether, when the multiplication is effected, the product will exceed the dividend or not. Thus, in the last example, in the case of the dividend 334, the partial divisor 4 will go *eight* times in 33, but since the product 8 × 48 is greater than 334, 7 is the next figure of the root, and not 8.

7. In the case of a decimal, if the number of decimal places be odd, it should always be made *even* by annexing a cipher, in order that the last period may be completed.

EXAMPLE.—Find the square root of 41·34156.

Here, adding a cipher, we point the decimal thus :—

$$\begin{array}{rl}
 & 4\dot{1}\cdot3\dot{4}1\dot{5}6\dot{0}\ (6\cdot429 \\
 & 36 \\ \hline
124) & 534 \\
 & 496 \\ \hline
1282) & 3815 \\
 & 2564 \\ \hline
12849) & 125160 \\
 & 115641 \\ \hline
 & 9519
\end{array}$$

And there will be 3 decimal places in the square root obtained.

Here there is a remainder, or the given decimal is not what is called a complete square. By adding, however, more ciphers, more and more figures can be obtained in the root, to any extent of approximation.

This is a similar case to that of $\sqrt{7}$ spoken of in Art. 2.

To approximate to the square root of 7, we should proceed thus:—

$$
\begin{array}{rl}
 & \dot{7}\cdot 0\dot{0}0\dot{0}\ (2\cdot 64 \\
 & 4 \\
\hline
46\,) & 300 \\
 & 276 \\
\hline
524\,) & 2400 \\
 & 2096 \\
\hline
 & 304
\end{array}
$$

By continually adding ciphers we can carry the approximation to any degree of nearness.

8. Similarly, in the case of any whole number which is not a complete square root, an approximation to the root by means of decimals can be obtained.

The integral part of the root obtained is, of course, the square root of the largest *integral* complete square, which is less than the given number.

9. The square root of a fraction is obtained by taking the square root of the numerator for a numerator, and the square root of the denominator for a denominator. This follows at once from the consideration that the multiplication of fractions is effected by multiplying the numerators for a numerator, and the denominators for a denominator. When either the numerator or the denominator is not a complete square, in which case the fraction itself evidently has no exact square root, instead of finding an approximate root of both numerator and denominator in decimals, and then dividing one by the other, it will be better first to reduce the fraction to a decimal, and then to take the square root.

Example.—To find the square root of $\frac{2}{7}$.

Reducing $\frac{2}{7}$ to a decimal, we find it to be $\cdot\dot{2}8571\dot{4}$ (see Art. 21, Vol. I., page 361).

Hence we should find by the previous method the square root of $\cdot 2\dot{8}571\dot{4}2\dot{8}57\dot{1}42\dot{8}$ . . . to as many decimal places as we please, by continually taking in more and more figures of the recurring periods.

Similarly, in finding the square root of $\frac{2}{5}$, we should proceed thus:—$\frac{2}{5} = \cdot 4$, and then find the square root of $\cdot\dot{4}0\dot{0}0\dot{0}$, etc., to as many places as we please.

Obs.—It does not follow that because the numerator and denominator of a fraction are not complete squares, that the fraction has no square root; for the division of numerator and denominator by some common measure may reduce them to perfect squares. Thus, $\frac{28}{63}$, when numerator and denominator are divided by 7, gives $\frac{4}{9}$, the square root of which is $\frac{2}{3}$. A fraction must be reduced to its lowest terms to determine whether it be a complete square or not.

10. *Abbreviated Process of Extraction of Square Root.*

When the square root of a number is required to a considerable number of decimal places, we may shorten the process by the following

Rule for the Contraction of the Square Root Process.

Find by the ordinary method one more than half the number of figures required, and then, using the last obtained divisor as a divisor, continue the operation as in ordinary long division.

Example.—Find the square root of 2 to 12 figures.

$$
\begin{array}{rl}
 & 2\cdot 0000,\text{ etc. } (1\ 414213 \mid 56237 \\
 & 1 \\
\hline
24\,) & 100 \\
 & 96 \\
\hline
281\,) & 400 \\
 & 281 \\
\hline
2824\,) & 11900 \\
 & 11296 \\
\hline
28282\,) & 60400 \\
 & 56564 \\
\hline
282841\,) & 383000 \\
 & 282841 \\
\hline
2828423\,) & 10075900 \\
 & 8485269 \\
\hline
 & 15906310 \\
 & 14142115 \\
\hline
 & 17641950 \\
 & 16970538 \\
\hline
 & 6714120 \\
 & 5656846 \\
\hline
 & 10572740 \\
 & 8485269 \\
\hline
 & 20874710 \\
 & 19798961 \\
\hline
 & 1075749
\end{array}
$$

Here, having obtained by the ordinary process the first seven figures, we get the rest by dividing as in ordinary division by the last divisor, 2828423.

11. We might extract the square root of a perfect square by splitting it into its prime factors, but unless the number is not large this would be a tedious method.

Example.—Find the square root of 441.

Following the method given in Lesson IV., Art. 5, page 225—

$$
\begin{array}{rl}
3\,) & 441 \\
\hline
3\,) & 147 \\
\hline
 & 49
\end{array}
$$

Therefore $441 = 3^2 \times 7^2$; of which the square root is 3×7, or 21.

Obs.—Unless a number is made up of prime factors, each of which is repeated an *even* number of times, it is not a perfect square.

EXERCISE 49.

(1) Find the square root of the following numbers :—

a. 529.
b. 5329.
c. 784.
d. 7056.
e. 27889.
f. 97 to 4 places of decimals.
g. ·81796 to 4 places.
h. 1169·64.
i. 8·172181 to 4 places.
j. 10842656.
k. [illegible]
l. 17[illegible] to 4 places.

(2) Find the square root of the following numbers by the abbreviated method :—

a. 365 to 11 figures in the root.
b. 2 to 12 figures.

(3) Extract the square root of 2116 by splitting it into prime factors.

12. *Extraction of the Cube Root.*

To extract the cube root of a given number is the same thing as resolving it into three equal factors.

As in the case of the square root, we must content ourselves with giving, without explanation of the reason of its truth, the

Rule for the Extraction of the Cube Root of a given number.

Mark off the given number into periods of three figures each, by placing a point over the figure in the unit's place and then over every third figure to the left (and to the right also, if there be any decimals). Put down for the first figure of the root the figure whose cube is the greatest cube in the first period, and subtract its cube from the first period, bringing down the next period to the right of the remainder, and thus forming a number which we shall call a dividend. Multiply the square of the part of the root already obtained by 3 to form a divisor, and then, having determined how many times this divisor is contained in the dividend without its two right-hand figures, annex this quotient to the part of the root already obtained.[*] Then determine three lines of figures by the following processes :—

1. Cube the last figure in the root.
2. Multiply all the figures of the root except the last by 3, and the result by the square of the last.
3. Multiply the divisor by the last figure in the root.

Set down these lines in order, under each other, advancing each successively one place to the left. Add them up, and subtract their sum from the dividend. Bring down the next period to the right of the remainder, to form a new dividend, and then proceed to form a divisor, and to find another figure of the root by exactly the same process, continuing the operation until all the periods are exhausted.

13. In decimals, the number of decimal places in the cube root will be the same as the number of points placed over the decimal part, *i.e.*, as the number of periods in the decimal part.

Obs.—If, finally, there be a remainder, then the given number has no exact cube root, but, as in the case of the square root, an approximation can be carried to any degree of nearness by adding ciphers, and finding any number of decimal places.

The rule will be best understood by following the steps of an example.

EXAMPLE.—Find the cube root of 78314601.

```
        78314601 ( 427
        64
       -----
  48 )  143,14
        ------
             8
           48
         96
         -------
         10088
         ---------
5292 )    42266,01
          ---------
               343
             6174
           37044
          ---------
           3766483
          ---------
            460118
```

Placing the points as indicated in the rule, we observe that the cube of 4 is the greatest cube in the first period 78. Subtracting 4^3, or 64, from 78, we get a remainder 14, to the right of which we bring down the next period 314. to form a dividend. Multiplying the square of 4 by 3, we get for a divisor 48, which will go 2 times in 143 (the dividend without its two right-hand figures). We set down 2, therefore, to the right of 4 as the next figure in the root, and then proceed to form the three lines according to the rule.

1. 8 is the cube of 2.
2. 48 is $3 \times 4 \times 2^2$.
3. 96 is the product of 2, the last obtained figure in the root; and 48, the divisor.

Placing these three lines under each other, but advancing each successively one place towards the left, and adding, we get 10088, which we subtract from the dividend 14314, leaving a remainder 4226. To the right of this we bring down the next period 601, thus forming another dividend.

The next divisor 5292 is 3×42^2, and is contained 7 times in 42266. Putting down, then, 7 as the next figure in the root, we form three lines as before :—

1. 343 is the cube of 7, the last figure in the root.
2. 6174 is $3 \times 42 \times 7^2$.
3. 37044 is 7×5292.

Adding these up when properly placed, we get 3766483, which we subtract from the previous dividend 4226601, leaving a remainder 460118.

There are now no more periods left. Hence 427 is the number whose cube is the nearest cube number to the given number, and less than it. If there were no remainder, the root obtained would be the exact cube root of the given number.

---

[*] It will be found necessary sometimes, as will be seen by the example given in Art. 15, to set down as the next figure in the root one less than this quotient.

14. In such an example as that worked out above, we could place a decimal point and as many periods of ciphers as we may wish after the original number, and thus, by continuing the process according to the rule, get as many decimal places as may be required as an approximation to the cube root.

In finding the cube root of a decimal, the periods must be completed by adding ciphers, if necessary.

15. When the cube root of a fraction is required, the cube root of the numerator and the cube root of the denominator will be the numerator and denominator respectively of the fraction which is the cube root of the original fraction. If the numerator and the denominator are not both perfect cubes when the fraction is reduced to its lowest terms (*vide* 9, *Obs.*), the best plan generally will be to reduce the fraction to a decimal, and then to find the cube root of that decimal. In the case of mixed numbers, they must be reduced to improper fractions, in order to see whether the resulting improper fraction has its numerator and denominator both perfect cubes. Thus, $5\frac{23}{64}$ reduced to an improper fraction gives $\frac{343}{64}$, of which the cube root is $\frac{7}{4}$, or $1\frac{3}{4}$. But if, when so reduced, the numerator and denominator are not perfect cubes, then it will be better to reduce the fractional part of the mixed number to a decimal, and placing the integral part before it, find the cube root by the above rule.

EXAMPLE.—Find the cube root of $44\frac{3}{5}$ to two places of decimals.

$44\frac{3}{5} = 44·6$.

```
          44·600000 ( 3·54
          27
          ─────
    27 )  17600
          ─────
            125
           225
          135
          ─────
          15875
          ───────
  3675 )   1725000
           ───────
                64
              1680
           14700
           ───────
           1486864
           ───────
            238136
```

And so on to as many more decimal places as we may desire.

Obs.—Exactly as in the case of the square root, when one more than half the number of figures required of the root have been found by the rule, the rest may be found by simply dividing, as in ordinary division, by the last divisor.

It will be observed that although 27, the first divisor, is really contained 6 times in 176, we only put down 5 in the root. The reason is that, on examination, we find that 6 would be too large, for it would make the sum of the three lines which we add up greater than the dividend 17600. This explains the note at page 53. We must, therefore, always be careful to observe whether the figure put down in that root will or will not make the sum of the three lines too large. The dividing the dividend without its two last figures by the divisor is not, therefore, an infallible guide to the next figure of the root.

EXERCISE 50.

Find the cube root of the following numbers :—

1. 2197.
2. 91125.
3. 571787.
4. 2515456.
5. 10218313.
6. 11543·176.
7. 20·570824.
8. ·241804367.
9. 87.
10. 6.
11. 40[illegible].
12. 399501·352125.

Where the given number is not a complete cube, the root may be found to seven decimal figures in each case, attention being paid to *Obs.* of Art. 15.

KEY TO EXERCISES.

EXERCISE 41.*

1. 1·41. 2. 14·1. 3. 141.
4. 5 9291. 5. 6·632 6. ·6344.
7. ·08. 8. 134·8806. 9. 59·406.
10. 4320·67. 11. 83671000. 12. ·000005.
13. 400000. 14. 1870. 15. 79098·8285.

EXERCISE 42.

1. (*a*) 1·2747. (*b*) ·0948. (*c*) 1·6116. (*d*) 57·2958.
2. 13. 3. 8. 4. 4 9834.†
5. 8·3.† 6. 7. 150·75.
8. (*a*) 46 728. (*b*) ·00008. (*c*) 67284·567.
(*d*) 103·42306. (*e*) ·42648621. (*f*) ·672800045.
9. (*a*) 8543·21. (*b*) 429802·13401. (*c*) 106723·50123.
(*d*) 608840·17. (*e*) 304672·14067. (*f*) 44632140·22.
10. ·09484. 11. 1·262648. 12. About 189·4 weeks.

EXERCISE 43.

1. ·02. 2. ·625. 3. ·000025.
4. Non-terminating. 5. ·0125. 6. ·025.
7. Non-terminating. 8. ·032. 9. Non-terminating.
10. Non-terminating. 11. Non-terminating.

EXERCISE 44.

1. $\cdot\dot{3}$. 2. $\cdot\dot{6}$. 3. $\cdot1\dot{6}$. 4. ·125.
5. $\cdot\dot{4}2857\dot{1}$. 6. $\cdot\dot{1}$. 7. 1·3125. 8. ·066
9. ·17. 10. 29·3506875.

EXERCISE 45.

1. [illegible]. 2. [illegible]. 3. [illegible].
4. [illegible]. 5. [illegible]. 6. [illegible].
7. 3[illegible]. 8. 857[illegible].

EXERCISE 46.

1. 91·4062214. 2. 111·0774488. 3. 23·5881568. 4. 1·2901587.

---

* In some cases the nearest approximate result to four figures of decimals has been given.

† Nearest approximate to four places of decimals.

EXERCISE 47.

1. (a) $6\cdot\dot{8}1481\dot{4}$, $8\cdot\dot{2}6262\dot{6}$, and $\cdot08\dot{3}333\dot{3}$.
   (b) $46\cdot\dot{1}6216\dot{2}$, $5\cdot\dot{2}6262\dot{6}$, $78\cdot\dot{4}2842\dot{8}$, $\cdot48\dot{6}666\dot{6}$, and $12\cdot\dot{5}5555\dot{5}$.
   (c) $\cdot\dot{2}\dot{7}7$, $\cdot\dot{3}\dot{3}$, $\cdot0\dot{4}\dot{5}5$.
   (d) $\cdot\dot{4}821821321321$, $6\cdot\dot{4}2684268426\dot{8}$, 6.
2.* (a) 179·274556. (b) 476·650281. (c) 47·870877. (d) 594·691919.
3.† (a) −99·39059. (b) −561·092. (c) −3·89468. (d) −87·45646.
4. (a) $9\cdot9\dot{2}8$. (b) $\cdot\dot{0}8\dot{2}$. (c) 1 8 (d) $389\cdot\dot{1}8\dot{5}$.
5. (a) $\cdot4176\dot{8}2\dot{5}$. (b) $55\cdot\dot{6}\dot{9}$. (c) $5\cdot\dot{4}146\dot{3}$. (d) $7\cdot\dot{7}\dot{2}$.

ASTRONOMY.—VII.

[*Continued from Vol. I., p.* 355.]

JUPITER—SATURN—URANUS—NEPTUNE—COMETS.

OUTSIDE this extensive group of small bodies we find the largest planet of our system, JUPITER, represented by the symbol ♃. The equatorial diameter of this giant orb is 87,000 miles. When in opposition it shines with a brilliancy nearly equal to that of Venus, and has been known to cast a perceptible shadow. It is a very conspicuous object in the firmament, and hence it has been known from the earliest ages.

Its mean distance from the sun is 484,000,000 miles, and it completes its journey round this body in 4332·58 days, or a few weeks less than twelve of our years. Its speed in its orbit is considerably less than half that of the earth. We always find, however, that the farther the planets are removed from the sun, the less is the speed at which they move.

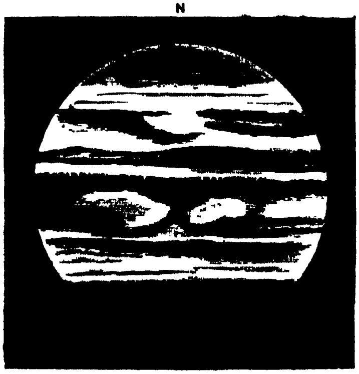


Fig. 24.—JUPITER'S BELTS.

The plane of Jupiter's orbit is inclined very slightly to that of the ecliptic, and hence there is a difficulty in ascertaining the exact points in which they intersect, and in determining the length of its years in the usual way. This is, however, easily overcome by ascertaining its synodic period, which is nearly 399 days, and calculating from this its sidereal period.

When examining this planet with a telescope, we are readily enabled to see that it is accompanied by four satellites or moons. Three of these were discovered on January 8th, 1610, by Galileo, when he first directed his telescope towards the planet, and the fourth a few evenings later. A very low power—such as that afforded by an ordinary opera-glass—suffices to show them all distinctly. It is even said that at times they have been seen by the unaided eye.

The annexed table gives us the more important facts about these satellites :—

No.	*Name.*	*Mean Distance.*	*Sidereal Period.*	*Diameter.*
1.	Io	267,380 miles.	1d. 18h. 27m.	2,252 miles.
2	Europa	425,160 „	3 13 14	2,099 „
3	Ganymede	678,390 „	7 3 43	3,436 „
4.	Callisto	1,192,820 „	16 16 32	2,929 „

When we inspect Jupiter (Fig. 24) with the aid of telescopic power, the most remarkable feature that strikes us is the number of almost parallel belts which mark its surface, as shown in the accompanying picture of the planet. Changes often occur in the number, appearances, and positions of these belts, but occasionally they remain for a long period with little variation. Usually there are two conspicuous dark belts situated near the planet's equator. These show an extent of red colouring at times. Numerous spots of varied tint and character are displayed amongst the belts, and from these the planet was found to rotate upon its axis with great rapidity. But the period cannot be said to admit of accurate determination, because the visible markings are merely atmospheric, and subject to irregularities of motion in which the sphere of Jupiter does not participate. A great red spot, of oval form and some 26,000 miles in length, became visible in 1878, and continues faintly in view at the present time. This curious object indicates the rotation of the planet as 9h. 55m. 37s. On the other hand there are white spots near the equator which give 9h. 50m. 10s., and some dark spots were seen in 1880 which gave only 9h. 48m. The equator of Jupiter must therefore travel with great velocity, for, adopting the rotation period of 9h. 50m., this part of the surface is carried along at the rate of 463 miles every minute, whereas the same part of the earth moves over not more than 17 miles in a similar interval.

By observing the attractive influences of the planets on one another astronomers are enabled to calculate their respective densities, and they find that the density of Jupiter is less than a quarter that of the earth, or, in other words, Jupiter, taking bulk for bulk, weighs less than a quarter as much as the earth does. The density of the latter is about five and a half times as great as that of water. Jupiter has a density little greater than that of water.

---

* Correct to 6 places of decimals.

† The greater quantity becomes minus, and addition of two minus quantities follows.

The interval between the planets is now becoming wider and wider, and we have to pass nearly 400 millions of miles beyond the orbit of Jupiter before we reach that of **Saturn** (♄). The mean distance of this body from the sun is 887,000,000 miles, but owing to the eccentricity of its orbit the real distance may be greater or less than this by nearly 50,000,000 miles. In this immense orbit Saturn revolves, accomplishing his journey round the sun in 10,759·2 days, or nearly 29½ years. In size it comes next to Jupiter, having an equatorial diameter of 73,000 miles. Its polar compression is, however, greater than that planet's, being set down by different observers at $\frac{1}{9}$ or $\frac{1}{10}$ of the diameter. The flattening is not so much observed as it otherwise would be, on account of the ring with which the planet is surrounded. This ring is the most remarkable peculiarity of Saturn, and appears to be quite unique in the whole solar system. To the early observers it caused a considerable degree of wonder.

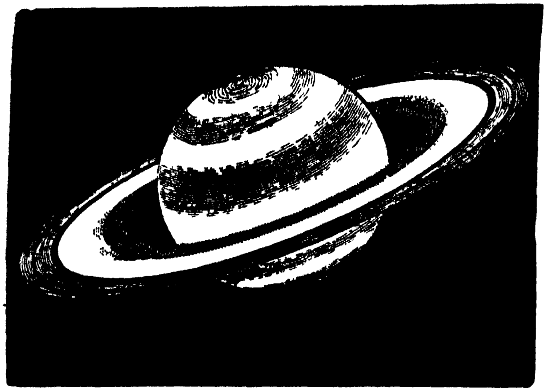


Fig 25 —Saturn and its Rings.

When telescopes were improved, and their powers increased, it was ultimately found that there were two concentric rings (Fig. 25); and numerous recent observations have shown that these again are probably divided, so that we must look upon the whole as a compound or multiple ring, made up of several distinct and separate ones. Three are, however, well marked, the innermost of which is commonly known as the *dusky ring*, and is partially transparent. From several phenomena that have been observed there seems ground for supposing that one or more of these rings may be fluid rather than solid.

The outer bright ring has an exterior diameter of about 166,000 miles, and it is upwards of 10,000 miles broad. The interval between this and the inner bright ring is but slight, but the latter has a breadth of 17,000 miles, and that of the dark ring is estimated at about half this amount, so that the united breadth of the whole is very great. Their thickness is, however, but small, being variously estimated at from 40 to 250 miles. When seen through a good telescope the appearance of this planet is very beautiful. At times the ring is presented with its edge to us, and is then almost invisible, being just discernible as a thread of light, along which some of the satellites appear to be travelling. As the earth moves out of the plane of the planet's equator, the ring opens out wider and wider, the projecting sides having the appearance of two handles, whence their technical name *ansæ*.

This opening or tilting of the ring attained its maximum at the beginning of 1885, and after that date slowly closed up again. Its edge will be directed to the earth again in about October, 1891, when the whole ring system will practically disappear, but Saturn will be too near the sun on that occasion to allow the phenomenon to be observed.

If we now turn our attention from the ring to the planet itself we find that its surface is marked with belts, so as somewhat to resemble Jupiter's. The markings are, however, more faint, and dark spots are very rarely seen on them, hence it becomes more difficult to ascertain the true period of rotation. It may, however, be set down as within a few seconds of 10h. 14m. 24s.

In addition to the compound ring, Saturn is accompanied in its journey round the sun by eight satellites. Two of these—the first and seventh—are so small as only to be seen in the most powerful telescopes; and several of the others require a good instrument to show them well. Owing to their distance from us our information respecting them is but limited. The annexed table shows in a concise form the most important facts. The diameters, however, with the exception of Titan's, are doubtful:—

No.	*Name.*	*Mean Distance.*	*Sidereal Period.*			*Diameter.*
1.	Mimas	120,800 miles.	0d.	22h.	37m.	1,000 miles.
2	Enceladus	155,000 ,,	1	8	53	? ,,
3.	Tethys	191,000 ,,	1	21	18	500 ,,
4.	Dione	246,000 ,,	2	17	41	590 ,,
5.	Rhea	348,000 ,,	4	12	25	1,200 ,,

No.	Name.	Mean Distance.	Sidereal Period.			Diameter.
6	Titan	796,000 miles.	15d.	22h.	41m.	3,300 miles.
7.	Hyperion	1,007,000 ,,	21	7	7	? ,,
8.	Iapetus	2,314,000 ,,	79	7	53	1,800 ,,

With so large a number of moons, and most of them revolving so rapidly, the sky must present a remarkable appearance to an observer on the surface of Saturn, and the varying phenomena of the ring must add in no small degree to this.

Of the two planets beyond the orbit of Saturn comparatively little is known, owing to their great distance from the earth. The nearer of these, URANUS (♅), is only faintly visible to the naked eye. It was discovered on March 13th, 1781, by Sir William Herschel, though it was some few months before its true planetary nature was recognised.

The name ultimately chosen for this planet was Uranus. Its diameter is approximately 32,000 miles, its mean distance from the sun 1,785,000,000 miles, and it displays belts upon its surface similar to Jupiter and Saturn. But no definite spots appear to have been distinguished in the large telescopes now existing, with sufficient effect to enable the rotation period to be ascertained. In completing a revolution round the sun Uranus occupies 84 of our years, or 30,687 days. One remarkable feature in connection with this member of our system is that its equator is greatly inclined to the plane of its orbit, the poles being nearly coincident with this plane. It is a natural result of this that at different periods the sun will be vertical to every region of the planet's surface.

Four satellites are definitely known to belong to Uranus. Two of these were discovered by Sir W. Herschel in 1787, and the remaining pair by Lassell in 1851. Several others were supposed to have been detected by Herschel, but these have never been recovered in the large instruments of our own day, and it is generally admitted that minute stars must have been mistaken for satellites. The four known satellites revolve in a direction contrary to that of all the other members of the solar system. Their periods and distances are as follow:—

No.	Name.	Mean Distance	Sidereal Period.		
1.	Ariel	123,000 miles.	2d.	12h.	28m.
2.	Umbriel	171,000 ,,	4	3	27
3.	Titania	281,000 ,,	8	16	55
4.	Oberon	376,000 ,,	13	11	6

The history of the discovery of the planet NEPTUNE forms perhaps one of the most remarkable and brilliant pages in the whole history of astronomy. Uranus, as we have seen, was discovered by accident, for it was some time before it was admitted to be a planet. With Neptune the case was entirely different. Nearly seventy years ago M. Bouvard attempted to calculate accurately the movements of Uranus, but found unexpected irregularities which could not then be accounted for.

If the planet alone were revolving round the sun, its place could be easily assigned, but each of the other planets exert an influence on it, and these influences are continually varying. All these were, however, allowed for, and yet there remained some disturbing cause which drew it out of its assigned place.

The opinion at length gained ground that some exterior planet must exist and cause these deviations. Accordingly, in the beginning of 1843, Mr. Adams began to investigate the matter with a view to ascertaining the place the exterior planet (should there be one) ought to occupy, and after nearly two years of diligent inquiry he announced to the Astronomer Royal the results of his inquiries. Nothing further was done at the time; but soon after a French astronomer, Le Verrier, independently applied himself to the same question, and obtained results closely resembling those arrived at by Mr. Adams. Upon this a search in the locality indicated was resolved upon, and with ultimate success, for the suspected planet was discovered on September 18th, 1846, close to the place indicated.

Little is known of this body, owing to its remoteness. Its mean distance from the sun is 2,796,000,000 miles, and it completes a revolution in 60,181 days, or 164¾ years. Its diameter is about 35,000 miles, so that in point of size it closely resembles Uranus. One satellite is known to accompany it. This was discovered in October, 1846, and revolves in 5 days 21 hours, at a distance from its primary of 220,000 miles. Probably a large number of satellites, hitherto unknown, attend both Uranus and Neptune. In the case of the earth, Mars, Jupiter, and Saturn the number of their satellites increase in duple proportion, so that if this law is maintained, Uranus must have sixteen satellites and Neptune thirty-two.

COMETS.

In the earliest ages comets were considered to be erratic bodies, and by no means subject to similar laws to those which regulate other members of the solar system. But the idea has long been known to be erroneous. The modern researches of astronomers have shown that comets are entitled to rank as important members of our system, moving in orbits which admit of being satisfactorily computed, and obeying the laws of gravitation with the same fidelity as the planets.

Comets were the objects of superstitious dread in remote times. The suddenness and mystery of their appearances were quite sufficient to create alarm. They were usually considered as evil portents, heralding the death of monarchs or the approach of war, famine, or pestilence.

As we have seen, the planets revolve around the sun in orbits of small eccentricity, which approach closely to circles. Comets, on the other hand, move in extremely elongated ellipses, parabolas, or hyperbolas, the sun being situated almost at one extremity of their orbits, so that often at their perihelion passage they approach within less than a million miles of it, and then swiftly recede to vast distances in remote space. It is clearly only those that move in elliptical orbits that can be periodical, for the other forms of cometary paths show that many of these bodies after leaving the sun pursue divergent courses to those which brought them into his vicinity.

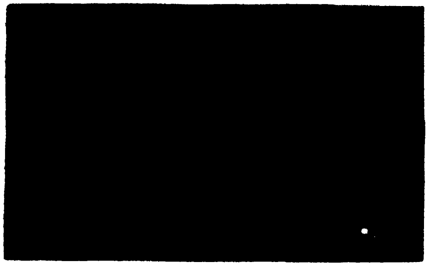


Fig. 26.—Comet of 1811

More than 300 comets have now had their orbits calculated, and of these a large proportion are known to be parabolic, so that no second return of these can occur, unless, by the attractions of other heavenly bodies, their orbits should be materially altered. Very few have been found to move in hyperbolic orbits. The number of known periodic, elliptic comets whose orbits and periods have been ascertained and verified is about thirteen; elliptic orbits have, however, been assigned to many others, but no second returns of them have yet been seen so as to test the calculations.

In former times, before the construction of the telescope, but few comets were observed. Now, however, scarcely a year passes without four or five being detected, and frequently the number is greater. For the most part, however, they are so small as to be invisible except in the field of good telescopes. It is only at rare intervals that very large ones, which are conspicuous to the unaided eye, become perceptible to us. The periods of these are, as a rule, very much longer than those of the telescopic ones, so that only the orbits of a few are decidedly elliptical. The first indication of a comet is usually a faint luminous speck visible with a telescope. This appears gradually but slowly to increase in size as the comet approaches the sun, and soon a bright spot known as the *nucleus* is discerned in it. This is generally of a circular form, and situated nearer to the side which is directed towards the sun. In telescopic comets this nucleus is not always discernible.

As the comet approaches the sun it becomes larger and brighter, the *coma* or cloudy mass around the nucleus also becomes less regular, and soon a tail begins to be thrown out on the side remote from the sun. It is this which forms the most remarkable feature in the appearance of a comet. The tail is usually more or less curved, and points away from the sun, so that when receding from that body the comet travels with its tail foremost. The annexed figure (Fig. 26) gives a good idea of the general appearance of these bodies. At successive returns comets seldom present the same aspect as before; hence they cannot be identified by their form, but only by the similarity of their orbits. According to many old illustrations, comets have presented very remarkable shapes, at times closely resembling swords or sabres. Allowance must, however, be made in these for the imagination of the artist excited by the terror occasioned by the appearance of these bodies. A few comets have had more than one tail. One, visible at the end of 1823, had, in addition to the usual tail, a second one directed towards the sun. The comet of 1744 is, however, the most remarkable, as it is stated that when it approached the sun the tail was divided into six distinct branches, all curved in the same direction, and extending 30° or 40° in length.

Halley's comet is one that has attracted as much attention as any, as it was the first whose orbit was calculated, and its period is the longest of all those whose paths are fully ascertained and verified by subsequent returns.

On its apparition in 1682, just after attention had been drawn to the phenomena of comets by the appearance, in 1680, of a brilliant one, whose orbit Sir Isaac Newton had investigated, Halley carefully examined its movements, so as to ascertain whether those of any which had previously been noted would in any way accord with them. He soon found that in several respects it seemed to resemble those of 1531 and 1607, and imagined that all three might be in reality appearances of the same body, its period being somewhere about 75½ years. This conjecture proved to be correct, and Halley's comet is now regarded as one of the members of our system.

The comet of 1858, known as Donati's, was very large and brilliant. It was first seen on the 2nd of June, at Florence, by Dr. Donati, after whom it is named. Its movements for the next two months were very slow. Towards the end of August faint traces of a tail began to be seen, and it soon became visible to the naked eye. It approached nearest to the sun on the 30th of September, its tail vastly increasing in length, being on the 10th of October upwards of 50,000,000 miles long.

On the 5th of October the comet passed in front of the star Arcturus, and though a portion of the tail at its densest part, having a thickness of several thousand miles, intervened, the star suffered no loss of brilliancy.

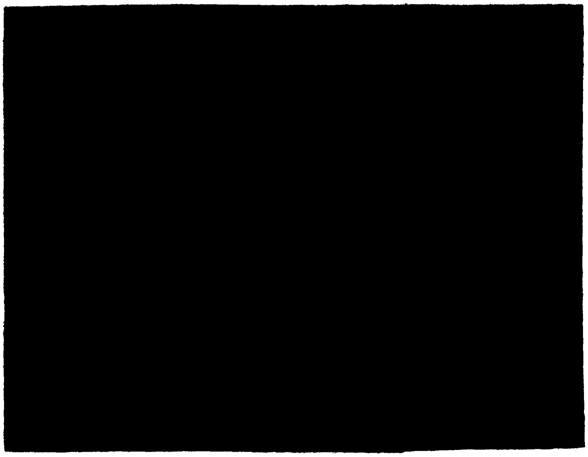


Fig 27.—View of the Nucleus of Coggia's Comet. July 12, 1884. (*J N. Lockyer.*)

In 1826 a comet was discovered by M. Biela, which has since possessed a remarkable history. The observations soon proved that its orbit was elliptical and its period a short one —namely, about 6½ years. It returned in May, 1832, agreeably to prediction. At its reappearance in 1845 it divided into *two distinct parts*, which in 1852 were seen again, the distance between them having somewhat increased in the interval. But since then this double comet has totally disappeared. Not a trace of it has been detected, though critically looked for by many observers when it ought to have been favourably visible. But there is no doubt that this comet, or rather its material, caused the splendid showers of meteors which were observed on the night of November 27 in 1872 and 1885. The earth intersects the comet's orbit on that date, and the meteors seen were directed precisely from that point of the heavens in which the remains of the comet must have been apparently moving. The inference is obvious therefore that this body has been broken up into an assemblage of meteorites, and it seems probable that on November 26th or 27th, 1891 or 1898, a further brilliant display of meteors will occur.

Encke's comet is another noteworthy object. It was the first comet of short period discovered; its period is only 3½ years. One remarkable feature of the motion of this body is that its time of revolution is becoming slightly shorter. This means that the orbit is closing in upon the sun. The explanation to this is that the comet encounters a resisting medium in space sufficiently dense to retard the comet and contract its orbit.

Of the physical constitution and changes of these bodies not much is definitely known. They certainly, however, appear to be dense aggregations of meteoric particles which are acted upon by the sun in a most extraordinary manner when in his vicinity. Though apparently so distended in size, they are evidently very light attenuated bodies. This is fully proved by their transparency and by the extent of the perturbations to which they are subject. Their orbits are sometimes totally changed by planetary attraction, but they seem to exercise no appreciable influence upon the other bodies with which they are brought nearly into contact.

There is an extreme improbability that the nucleus of a comet will ever come into collision with the earth. It is, however, quite a possible event. In such a case no calamitous results need be anticipated for a moment. The earth would neither be thrown from its orbit or disturbed in any material way. There would simply occur a magnificent display of shooting stars. Our atmosphere would act as a shield and consume the cometary fragments as rapidly as they rushed into it.

Several large comets have approached so near to the sun as almost to graze its surface. The heat to which they were exposed must therefore have been enormous, and they must have undergone great physical disturbance while so powerfully acted upon. The brilliant comets of 1680, 1843, 1880, and 1882 all approached the sun to within a critically small distance.

Fig. 26 represents the great comet of 1811, which was one of the most conspicuous of these objects that have been noticed during the present century. It continued visible during the long period of 17 months, and in the autumn of 1811 its tail, 25 degrees in length, and 6 degrees in breadth, imparted to it a very striking aspect. The diameter of its nucleus was computed at 428 miles, and the period of the comet was approximately determined as about

3,000 years! Fig. 27 gives a telescopic view of the head of a fine comet which made its apparition in the summer of 1874. Other large comets were perceived in 1880, 1881, and 1882, and they displayed the usual series of phenomena which attend these bodies.

As to the number of comets connected with our system we cannot form a reliable estimate. Kepler referred to comets as being as numerous as the fishes in the ocean, and no doubt he was correct.

The following is a list of the periodical comets fully recognised as belonging to the solar system. There are many others which are doubtless of the same class, but these are awaiting confirmation:—

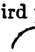
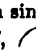
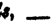
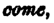
Name.	Period.	Last Return observed.
Encke's	3·287 years	1888
Tempel's (1873)	5·200 ,,	1878
Brorsen's	5·462 ,,	1879
Pons-Winnecke's . . .	5·730 ,,	1886
Tempel's (1867)	5·982 ,,	1879
Swift's	5·904 ,,	1880
D'Arrest's	6·644 ,,	1877
Biela's	6·617 ,,	1852
Faye's	7·566 ,,	1888
Tuttle's	13·811 ,,	1885
Pons-Brooks's	71·356 ,,	1884
Olbers's.	72·465 ,,	1887
Halley's.	76·730 ,,	1835

Other comets such as Wolf's (1884, 6½ years); Barnard's (1884, 6½ years); Denning's (1881, 9 years); Tempel's (1866, 33¼ years); Stephen's (1867, 33½ years); Westphal's (1852, 67¾ years); De Vico's (1846, 73¼ years); and Brorsen's (1847, 75 years), will almost certainly be reobserved when the periods of their expected reappearances arrive.

SHORTHAND.—VII.

[*Continued from Vol. I., p. 367.*]

125. Logograms that are written *above* the line (except horizontal and vowel logograms), or *through* the line, cannot be employed on unruled paper. These words should in that case have their remaining consonants or vowels inserted. They are employed in printed Phonography, although it is done on unruled paper, that it may serve as a guide to the writer of the Corresponding Style, and the line underneath or through such words is dotted in. In manuscript Phonography it is less trouble to vocalise such words than to insert this dotted line.

126. *S* may be added to a logogram to mark the plural number or the possessive case of a noun, or the third person singular of a verb; as, *good*, *goods*,  *Lord*,  *Lords*,  *come*,  *comes*, *disadvantages.*

127. In general, the positions of the grammalogues, ABOVE, ON, and THROUGH the line, are determined by their vowels; and in the case of a word of more than one syllable, by its accented vowel. The positions of words, as determined by their vowels, are:—For perpendicular and sloping strokes, 1st position, *ah*, *aw*, *ī*, *oi*, *wī*, ABOVE the line; 2nd position, *ā*, *ō*, ON the line; 3rd position, *ē*, *oo*, *ow*, *ū*, THROUGH the line.

128. Horizontal consonants and vowel logograms have but TWO positions: 1, *ah*, *aw*, *ī*, *oi*, ABOVE the line: 2, *ā*, *ō*, *ē*, *oo*, *ow*, *ū*, ON the line. A third position, UNDER the line, for *ē*, *oo*, *ow*, *ū*, would not be distinguishable from the second when writing on unruled paper.

129. All grammalogues are written IN POSITION in accordance with the above rules, and are thus easily remembered, except—

Irregular Grammalogues.—Class 1.—Words of frequent occurrence, written ON THE LINE for the sake of convenience. They are: *advantage, are, be, been, dear, do, for, from, have, if, it, lord, phonography, shall, think, upon, usual, was, we, which, will, your.*

Class 2.—Words which in their proper position would clash with some other grammalogue. They are: *any, go, ago, in, me, more, much, number, O, over, particular, this, those, though, truth, with.*

130. Phonography may be written on plain paper, or on paper ruled with either single or double lines. Our own practice is to employ either plain or single-line paper: we find the double lines perplexing. The three positions for logograms on double-line paper are distinguished thus:—1, If down or up strokes, *through* the top line; but if horizontal or half-length sloping, *under* it; 2, *on* the bottom line; 3, if down or up strokes, *through* the bottom line, and if horizontal or half-length, *under* it.

Exercise 24.

On the Abbreviating Hooks, etc.,

(*See Vol. I., pp. 252, 317, and 364.*)

To be written by the pupil in Phonography and in Longhand.

N Hook.

1. cone, town, deign, chin, Jane, pine, bean, run (upward *r*).
2. cones, towns, deigns, chins, Jane's, pines, beans, runs (upward *r*).
3. shine, then, fawn, vaiL, lawn, earn (downward *r*), known, moan.
4. shines, fawns, veins, lawns, leans, earns, man's, moons.

F or V Hook.

5. dove, devour (upward *r*), divide, above, approve, brave, chaff.

6. groove, rough, pave, scoff, serve, tough, turf, serf, surf, crave.
7. rife, achieve, brevity, defer, derive, deprave.
8. divine, divinity, dovetail, refer, reference, profit, mischief.

-TION Hook.

9. fashion, mission, motion, notion, nation, oration, lotion, evasion, vision, session, elation, solution, delusion, donation, mention, invasion, dimension, nomination, invention, pension, relation, cremation, salvation, evolution, infusion, collision, veneration, provision, pollution, ammunition, initiation, appreciation, reservation, intimation, revelation.
10. option, potion, passion, auction, caution, cushion, apparition, education, diction, duration, variation, Egyptian, implication, aberration, abortion, coercion.
11. suppression, attrition, Grecian, abrasion, suction, equation, accretion, secretion, expression, selection, location, faction, fiction, vocation. vacation, approbation, illustration, emigration, addition, imitation, exhortation, deputation, vegetation.
12. missionary, optional, visionary, illusionary, occasional, educational, sectional, eviction, evacuation, attenuation, notation, intuition, passions, stations, sessions, relations, occupations, explanations, gradations, divisions.
13. possession, precision, procession, requisition, disquisition, inquisition, incision, pronunciation, authorization, sensation, dissuasion, evangelization, cessation, transition, suppositions, accusations, pulsations, positional, transitional.

ST and STR Loops.

14. abased, abreast, attest, boast, bust, cast, chaste, crust, durst, dust.
15, fast, fist, ghost, grist, infest, inmost, jest, just, last, list, lost.
16. mast, mist, most, next, nest, oppressed, paste, pest, post, quest.
17. request, roast, stage, steal, steam, suggest, text, trust, utmost.
18. castor, Chester, faster, fluster, Leicester, Manchester, minister.
19. monster, muster, poster, punster, Ulster, Winchester, youngster.

S-TION Hook.

20. decision, disposition, vexation, possession, position, opposition.
21. exposition, physician, compensation, organisation, transition. (*In the last three words, turn the ns circle on the left.*)

Lengthened Curve, adding TR, DR, or THR.

22. enter, another, Easter, oyster, loiter, latter, alter, shatter, softer, fender, founder, offender, asunder, smatter, smoother, mounter, psalter, slighter, Walter, slander, islander, fomenter, Sunderland, bewilder (*b, upward ldr, vocalise with wi*).
23. remainder, reminder (*show a slight angle between r and mndr*), defender (*f hook*), wilderness, idolater, pamper, temper.
24. ponder, pointer, planter, bender, brander, tender, attainder, tinder, chanter, gender, counter, gander, grander, grafter, ranter, rounder, rafter, winter, surrender, yonder, hinder.
25. acceptor, captor, rector, erector, persecutor, engender, elector, discounter, nectar, darter, depender, curator, counteract, detractor, Jupiter, prosecutor, vindicator, arbitrator, participator, inspector, moderator, mitigator, distributor, lubricator, litigator, liberator, deprecator, alligators, tormentor, progenitor, pretender.

The pupil should now test his progress by submitting his work to the examination of a competent phonographer. He is recommended to send a shorthand exercise (with interlined longhand, leaving a blank line under every two lines thus filled for corrections,) to some member of the Phonetic Society for examination, and correction if necessary. His request will be cheerfully complied with, and he will be invited to forward other exercises for correction. The lesson should be accompanied by a stamped and directed envelope for its return. A List of the Society for the current year may be obtained from Messrs. Isaac Pitman & Sons.

General Rules for Writing.

131. Positions of Words.—Phonographers who wish to become reporters should cherish reporting habits as soon as they can write the system fluently. In following a rapid speaker it is impossible to insert many vowels. If then we can, by a difference in the POSITION of a consonant outline, INDICATE the vowel, or principal vowel, of the word, it will facilitate the reading of the report. In the Reporting Style, a word that contains only one or two consonant strokes is written IN POSITION, in accordance with its vowel, or accented vowel, as explained in paragraph 127.

As a general rule, no advantage would arise from placing IN POSITION a word that contains three or more consonant strokes, because in such cases there is seldom any other word written by the same outline for which, if left unvocalised, it could be mistaken.

132. A word composed of a horizontal and a down or up stroke has its position determined by the down or up stroke, and not by the horizontal one; or, in other words, a horizontal letter, when initial, in the first position, and followed by a perpendicular stroke, must be written a little higher than usual to accommodate itself to the position of the following stroke; and when initial, in the first position, and followed by an up stroke, it must be written a little lower, for the same reason.

133. A double-length curve takes three positions; two positions, ON and ABOVE the line; and one position, THROUGH the line, if perpendicular.

134. TWO VOWELS CONCURRING.—When two vowels occur either before or after a consonant, the vowel that is sounded nearest to the consonant should be written nearest to it; thus, *iota*, *Messiah*. When two vowels occur between two consonants, one is placed to each; thus, *quiet*, *Israel*. The diphthongs ī-a, oi-a may be written thus, *diamond*, *royal*.

135. DISSYLLABIC DIPHTHONGS.—The following form a series:—

ah-i, *eh-i*, *ee-i*, *aw-i*, *oh-i*, *oo-i*.

This series may represent diphthongs composed of an accented long vowel and ANY short vowel except *ŏŏ;* thus, the first sign may be written alike in "solf*a*ing" and "solf*ae*rs" also for *ay* (yes); the second in "s*ay*ing, cl*ay*ey, *ae*rated, b*ay*onet;" the third in "b*e*ing, r*e*al, th*e*ory, mus*eu*m;" the fourth in both "s*oi*l" (one syllable) and "s*aw*ing" (two syllables), etc. Note the accent in *póetry*, where the dissyllabic diphthong is used, and in *poëtic*, where two separate vowels are written. The sign of the diphthong should be written in the place of the long vowel; as, *poem*. In *alien*, *fol*io, *create*, etc., where the first vowel of the diphthong is not accented, the *yah* series of vowels should be used.

136. NOMINAL CONSONANT.—Vowels may be written without consonants by using as outlines which have no specific values; thus *E* for *Edward* or *Emma*, *I* for *Isabel*, or *ah!* (*ah!*), or *eh?* or *aye* (e, ever). The stroke vowels may be struck horizontally THROUGH the nominal consonant, as *O* for *Oliver*, *ŭ*, *ŏŏ*. Christian names should be written in full when they are known.

CONSONANT OUTLINES.

137. Seeing that in the Phonographic Alphabet *s, r, w, y,* have duplicate forms, that three other letters (*sh, l, h*) may be written either upward or downward, and that many groups of consonants may be expressed either by their alphabetic forms or by abbreviations, it is evident that many words may be written in more than one way. For any given word the writer should choose that form which is most easily and rapidly written, and is at the same time capable of being clearly vocalised. The briefest outline to the eye is not always the most expeditious to the hand.

The student will insensibly acquire a knowledge of the best forms by practice and observation, and especially by reading some book printed in Phonography. The following special rules embrace the principal CLASSES of words that admit of various outlines.

138. STROKE *H*.—The stroke *h*, when medial, must be so joined that the upward *h* cannot be read as *sr*, nor the downward *h* as *sch;* thus [not] *abhor*, [*not*] *Mayhew*. The DOWNWARD *H* may be joined to the three sibilants, *ch*, *s*, *sh*, thus, *ch*, *h*, *Jehu*, *Soho*, *Sahara*, *Sheehy*. (*The combinations ch, schr; j, schr; s, s, ch; sh, s, ch, do not occur in English.*) To *k*, *m*, *l*, and the upward or downward *r*, it may be joined thus, *cohere*, *Elihu*, *Rehum* (Ezra iv. 8), *Aarhuus* (*in Holland*). The medial UPWARD *H* may be joined to *p*, *t*, *ch*, thus, *upheave*, *behave*, *Tahiti*, *adhere*, *Jehovah;* to *f*, *th*, thus, *Thahash;* to *n*, thus, *enhance;* and to the upstrokes *r*, *w*, *y*, *h*, thus, *rehearse*, *weigh-house*, *Fitzhugh*—the circle *s* and the first part of *h* making a large circle, which cannot be mistaken for *ftsr*. (*Sr after upward r, w, y, h, would have the circle on the other side.*)

139. DOT *H*.—*H* is represented by a dot before the vowel sign; thus, *happy*, *had*, *uphill*, *perhaps*, *manhood*. The dot aspirate cannot be used AFTER A CONSONANT; thus is *Appii* (Acts xxviii. 15), not *Ap-hy*.

140. INITIAL *L*.—When *l* precedes a horizontal consonant it is written downward if a vowel precedes, and upward otherwise; thus, *alike*, *like*, *alum*, *alone*, *Lennie*.

141 FINAL *L*.—After the upward *r*, *w*, *wh*, *y*, *h* (*up*), *f*, *v*, *sh*, *shw*, *L* is written downward when

final, and upward if followed by a vowel; thus, *roll*, *relay*; *waylay*; *Yale*, *yellow*; *Howell*, *halo*; *fool*, *fellow*; *vale*, *valley*; *skill*, *sickly*; *squall*, *squally*. In other cases write the *l* up.

142. INITIAL *R.*—When *r* is the first or only consonant in a word it is written downwards if a vowel precedes, and upwards if a vowel does not precede; thus, *tare*, *Tory*; *fear*, *fury*; *pare*, *perry*; *car*, *carry*; *jeer*, *jury*.

143. JOINED VOWELS.—At the beginning of a word a vowel may be joined to a consonant in the following cases:—*waw*, *wŏ*, before *k*, *r* (up), *m*, *tr*, *chr*, and *shr*; and the diphthong *ī*, before *t*, *sh*, *s*, *th*, *p*, *f*, *r* (down); thus, *walk*, *water*, *war*, *alter*, *alteration*, *oil*, *owl*, *item*, *wide*; also in such cases as *pew*, *virtue*, *due*, *Matthew*, *new*, *continue*, *about*, *doubt*.

144. The following compounds are thus written: *Almighty*, *almost*, *already*, *although*, *always*, *all-wise*.

CONTRACTIONS.

145. When *P* occurs between *m* and *t*, *T* between *s* and another consonant, or *K* or *g* between *ng* and *t* or *sh*, the *p*, *t*, or *k* may be omitted in Phonetic Shorthand, as,

P. *stamped* (from *stamp*), *cramped*, *thumped*.

T. *postal*, *postcard*, *postage stamps*, *lastly*, *New Testament*, *testimony*, *institute*.

K. *anxious*, *sanction*, *distinct*, *distinguish*.

146. TICK *THE.*—*The*, the most frequent word in the English language, may be expressed by a short slanting stroke joined to the preceding word, and generally written downward; thus, *in the*, *for the*, *of the*, *with the*, *to the*; but when more convenient, it is written upward; thus, *at the*, *on the*. The first stroke of *on the* is made sloping to keep the sign distinct from *I*. The tick *the* never BEGINS a phrase.

147. OF THE.—The connective phrase "of the," is intimated by writing the words between which it occurs NEAR TO EACH OTHER, thus showing that the one is *of the* other; thus, *love of the beautiful*, *plan of the work*. The prefix *con* or *com* (*see par.* 110) cannot be mistaken, in practice, for this mode of expressing *of the*.

148. The pupil is recommended to be sparing in his use of contractions in the commencement of his practice. In the Reporting Style, every legible contraction may be brought into use. The advanced writer may use the following contractions. Some consist merely in joining the prefix or affix to the rest of the word. Words marked (*) are written above the line.

LIST OF CONTRACTIONS.

Acknowledge-d
altogether *
anything *
architect-ure
Catholic
character *
Danger
destruction
difficulty
doctrine
domestic
Enlarge-d
especial-ly
essential-ly
establish-ed-ment
expect-ed
Govern-ed -ment
Immediate
immediately
impossible *
inconsistent
influence *
influenced *
influential *
information *
instruction
interest-ed
irregular
Kingdom *
knowledge
Magazine
manuscript
messenger
mistake-n *
more than *
and so with
better than
rather than
Natural-ly
neglect-ed *
never
nevertheless
next
nothing
notwithstanding
Object
objection
Parliament-ary
peculiar-ity

perform-ed
Phonetic Journal
Phonetic Society
phonographer
phonographic
practice-cal-ly
probable-bly *or* probability
prospect
public-sh-ed
publication
Rather *or* writer
reform-ed
reformation
reformer
regular
remark-ed-able, remarkably
represent-ed
representation
representative
republic
respect-ed
Reverend
Satisfaction
satisfactory
something
Spelling reform
stranger
subject
subscription
surprise *
Temperance Society
Thankful *
together
transcript
transfer
transgress
transgression (149)
Unanimity *or* unanimous
understand
understood
uniform-ity
Whatever
whenever
Yesterday

149. *Transaction* should be written at length because the contracted form might clash with *transgression*.

PHRASEOGRAPHY.

150. In longhand, swift writers join all the letters of a word together, and sometimes write several words without lifting the pen. In Phonography also several words may often be united. This practice, which is called Phraseography, gives great assistance to the writer in following a rapid speaker. The following examples will show how other useful phraseograms may be formed.

LIST OF PHRASEOGRAMS.

and have
and the *
as well as*
could not
do not*
for this reason
had not *
has not *
he may
he would
I am *
I do
I have
I will *
is not
it is
it is not
it is said
it should be
it would be
may be
of course *
our own
should be
should do
so that
that is *
they will
this is
we are
we have not
we have seen
when he was
which cannot
who have
who would
you can
you cannot
you may
you must
you must not
you will do

151. ACCENT may be shown by writing a small cross close to the vowel of the accented syllable; thus, *arrows*, *arose*, *renew*.

152. EMPHASIS is marked as in longhand, by drawing one, two, or more, lines underneath; a single line under a single word must be made wave-like, thus ∿∿∿, to distinguish it from — *k*. In preparing manuscript for the press, a single line thus drawn underneath (*wavy for a single word, and straight for more than one*), signifies *italic;* two lines (*which need not be waved*), SMALL CAPITALS, and three lines LARGE CAPITALS. For *ITALIC CAPITALS* draw three lines, and write "Italic" close by.

153. An INITIAL CAPITAL is marked by two short lines under the word; thus, *The Times* newspaper, *Abel.*

154. FIGURES are written as usual, or the words may be expressed in Phonography. When, however, the figures *one* and *six* are written by themselves, they should be formed thus, 1, 6, in order that they may not be mistaken for shorthand characters.

REPORTING.

155. In the "Reporter's Companion" the reader will find further principles of abbreviation that will enable him to attain the goal of verbatim reporting.

As it is almost impossible for rapid writers of Phonography to adhere strictly to the Corresponding Style, as developed in this series, a list of the **PRINCIPAL** reporting grammalogues is given in the next lesson to assist in reading the Reporting Style.

LATIN.—VIII.

[*Continued from p.* 10.]

THE PRINCIPAL PARTS OF THE VERB (*continued*).

SECOND CONJUGATION.

Perfect formed by reduplication:

Pres.	*Perf.*	*Sup.*	*Inf.*	
Mordeo	mŏmordī	morsum	mordēre	*bite.*
Pendeō	pĕpendī	pensum	pendēre	*hang* (intr.).
Spondeō	spŏpondī	sponsum	spondēre	*promise.*
Tondeō	tŏtondī	tonsum	tondēre	*shear.*

Perfect formed by lengthening stem-vowel:

Căveō	cāvi	cautum	cavēre	*beware.*
Făveō	fāvī	fautum	favēre	*support.*
Fŏveō	fōvi	fōtum	fovēre	*foster.*
Mŏveō	mōvi	mōtum	movēre	*move* (tr.)
Sĕdeō	sēdi	sessum	sedēre	*sit.*
Vīdeō	vīdi	vīsum	vidēre	*see.*
Vŏveō	vōvi	vōtum	vovēre	*vow.*

Perfect in *-ui* or *-ivi*:

Censeō	censuī	censum	censēre	*assess.*
Cīeō	cīvi	cĭtum	cīēre	*set in motion.*
Dēleō	delēvi	delētum	delēre	*blot out.*
Dŏceō	docuī	doctum	docēre	*teach.*
Ferveō	ferbuī *or* fervī		fervēre	*boil* (intr.).
Flĕō	flēvī	flētum	flēre	*weep.*
Misceō	miscuī	mixtum *or* mistum	miscēre	*mix* (tr.).
Nĕo	nēvī	nētum	nēre	*spin.*
Ab-ŏleō	abolēvī	abolĭtum	abolēre	*destroy.*
Com-pleō	complēvī	complētum	complēre	*fill.*
Tĕneō	tenui	tentum	tenēre	*hold.*
Torreō	torrui	tostum	torrēre	*roast.*

Perfect formed by adding *s*:

Algeō	alsī		algēre	*be cold.*
Ardeō	arsi		ardēre	*be on fire.*
Augeō	auxī	auctum	augēre	*increase* (tr.).
Fulgeō	fulsī		fulgēre	*shine.*
Haereō	haesī	[haesūrus]	haerēre	*stick* (intr.).
Indulgeō	indulsī		indulgēre	*give way.*
Jŭbeō	jussī	jussum	jubēre	*command.*
Lūceō	luxī		lucēre	*shine.*
Lūgeō	luxī		lugēre	*mourn.*
Măneō	mansī	mansum	manēre	*remain.*
Mulceō	mulsī	mulsum	mulcēre	*stroke.*
Mulgeō	mulsi		mulgēre	*milk.*
Rīdeō	risī	rīsum	ridēre	*laugh.*
Suādeō	suasī	suasum	suadēre	*advise.*
Tergeō	tersi	tersum	tergēre	*wipe.*
Torqueō	torsī	tortum	torquēre	*twist.*
Urgeō	ursi		urgēre	*press.*

Perfect stem the same as present stem:

Langueō	languī		languēre	*be faint.*
Prandeō	prandī	pransum	prandēre	*lunch.*
Strīdeō	strīdī		stridēre	*screech.*

The following have a deponent perfect:

Pres.	*Perf.*	*Inf.*	
Audeō	ausus sum	audēre	*dare.*
Gaudeō	gavīsus sum	gaudēre	*rejoice.*
Pŭdĕt	pudŭit *or* pudĭtum est	pudēre	*make ashamed* (impers.).
Sŏleō	sŏlĭtus sum	solēre	*be accustomed.*
Taedĕt	taesum est	taedēre	*weary* (impers.)

THIRD CONJUGATION.

Perfect formed by reduplication:

Pres.	*Perf.*	*Sup.*	*Inf.*	
Cădō	cĕcĭdī	cāsum	cadere	***fall.***
Caedō	cĕcīdī	caesum	caedere	***cut.***
Cănō	cĕcĭnī		canere	***sing.***
Con-cĭnō	concĭnŭī		concinere	***sing in concert.***
Currō	cŭcurrī	cursum	currere	***run.***
Discō	dĭdĭcī		discere	***learn.***
Fallō	fĕfellī	falsum	fallere	***deceive.***
Parcō	pĕpercī		parcere	***spare*** (intr.).
Părĭō	pĕpĕrī	partum	parere	***produce.***
Pellō	pĕpŭlī	pulsum	pellere	***drive back.***
Pendō	pĕpendī	pēnsum	pendere	***weigh, pay.***
Poscō	pŏposcī		poscere	***demand.***
Sistō	stitī		sistere	***stay*** (tr.).
Tangō	tĕtĭgī	tactum	tangere	***touch.***
Tendō	tĕtendī	tentum	tendere	***stretch.***
Tundō	tŭtŭdī	tunsum	tundere	***thump.***

Compounds of dō, dĕdī, dătum, dăre, ***give:***

Ab-dō	abdĭdī	abdĭtum	abdĕre	***put away.***
Crēdo	credĭdi	credĭtum	credere	***believe.***
Vendō	vendĭdī	vendĭtum	vendere	***sell.***
Abs-con-dō	abscondī	abscondĭtum	abscondere	***conceal.***

Perfect formed by lengthening stem-vowel:

Ăgō	ēgī	actum	agere	***drive, do.***
Cōgō	coēgī	coāctum	cogere	***compel.***
Căpĭō	cēpī	captum	capere	***take.***
Ĕdō	ēdi	ēsum	esse *or* edere	***eat.***
Ĕmō	ēmi	emptum	emere	***buy.***
Făcĭō	fēci	factum	facere	***make.***
Fŏdĭō	fōdi	fossum	fodere	***dig.***
Frangō	frēgi	fractum	frangere	***break.***
Fŭgĭō	fūgi	[fŭgĭtūrus]	fugere	***fly.***
Fundō	fūdi	fūsum	fundere	***pour.***
Jăcĭō	jēcī	jactum	jacere	***throw.***
Lĕgō	lēgi	lectum	legere	***pick, read.***
Linquō	līqui		linquere	***leave.***
Pangō	pēgi	pactum	pangere	***fasten.***
Rumpō	rūpī	ruptum	rumpere	***break.***
Vincō	vīcī	victum	vincere	***conquer.***

Perfect formed by suffixing *-ui* or *-vi*:

Cŏ-ălescō	coalui		coalescere	***grow together.***
Ălō	aluī	altum *or* ălĭtum	alere	***nourish.***
Capessō	capessīvi	[capessītūrus]	capessere	***undertake.***
Cernō	[crēvi]	[cretum]	cernere	***sift, descry.***
Dē-cernō	dēcrēvī	dēcrētum	decernere	***decide.***
Ar-cessō	arcessīvi	arcessītum	arcessere	***send for.***
In-cessō	incessīvi	incessītum	incessere	***attack.***
Cŏlō	coluī	cultum	colere	***look after.***
Consŭlō	consului	consultum	consulere	***consult.***
Crescō	crēvī	crētum	crescere	***grow*** (intr.).
Oc-cŭlō	occŭluī	occultum	occulere	***conceal.***
Ac-cumbō	accŭbuī	accubĭtum	accumbere	***recline*** (at table).
Depsō	depsuī		depsere	***knead.***
Făcessō	facessīvī	facessītum	facessere	***cause.***
Frĕmō	fremuī	fremĭtum	fremere	***roar.***
Gĕmō	gemui	gemĭtum	gemere	***groan.***
Gignō	gĕnuī	genĭtum	gignere	***produce.***
Lăcessō	lacessīvī	lacessītum	lacessere	***provoke.***
Linō	lēvi *or* līvi	lĭtum	linere	***smear.***
Mĕtō	[messui]	messum	metere	***mow.***
Mŏlō	molui	molĭtum	molere	***grind.***
Noscō	nōvī	nōtum	noscere	***get to know.***
A-gnoscō	agnōvī	agnĭtum	agnoscere	***recognise.***
Co-gnoscō	cognōvī	cognĭtum	cognoscere	***know.***
I-gnōscō	ignōvī	ignōtum	ignoscere	***pardon.***
Nōtēscō	nōtui	nōtum	notēscere	***become known.***
Pascō	pāvī	pastum	pascere	***pasture.***
Com-pescō	compescŭi		compescere	***confine.***
Pĕtō	petīvi	petītum	petere	***seek.***
Pinsō	pinsui *or* pinsi	pinsītum, pistum, *or* pinsum	pinsere	***pound.***

Pres.	*Perf.*	*Sup.*	*Inf.*	
Quaerō	quaesīvī	quaesītum	quaerere	*inquire.*
Răpiō	rapuī	raptum	rapere	*snatch.*
Săpiō	sapīvī		sapere	*taste of.*
Sciscō	scīvī	scītum	sciscere	*enact.*
Sĕrō	sēvī	sătum	serere	*sow.*
Sĕrō		sertum	serere	*bind.*
Sīnō	sīvī	sĭtum	sinere	*allow.*
Pōnō	pŏsŭī	pŏsĭtum	ponere	*place.*
Spernō	sprēvī	sprētum	spernere	*despise.*
Sternō	strāvī	strātum	sternere	*throw down.*
Stertō	stertuī		stertere	*snore.*
Strĕpō	strepuī		strepere	*rattle.*
Suescō *or* sŭescō	suēvī *or* sŭēvī	suētum	suescere *or* sŭescere	*become* *accustomed.*
Tĕrō	trīvī	trītum	terere	*rub.*
Trĕmō	tremuī		tremere	*tremble.*
Vŏmō	vomuī	vomĭtum	vomere	*vomit.*

Perfect formed by adding *s:*

Com-būrō	combussī	combustum	comburere	*burn up.*
Carpō	carpsī	carptum	carpere	*pluck.*
Cēdō	cessī	cessum	cedere	*give way.*
Cingō	cinxī	cinctum	cingere	*gird.*
Claudō	clausī	clausum	claudere	*shut.*
Cōmō	compsi	comptum	comere	*arrange.*
Cŏquō	coxī	coctum	coquere	*cook.*
Dēmō	dempsī	demptum	demere	*take away.*
Dīcō	dixī	dictum	dicere	*say*
Dīvīdō	dīvīsī	dīvīsum	dividere	*divide.*
Dūcō	dūxī	ductum	ducere	*lead.*
Figō	fixī	fixum	figere	*fix.*
Fingō	finxī	fictum	fingere	*mould.*
Flectō	flexī	flexum	flectere	*bend.*
Af-flīgō	afflixī	afflictum	affligere	*knock down.*
Flŭō	fluxī	fluxum	fluere	*flow.*
Gĕrō	gessī	gestum	gerere	*carry, do.*
Jungō	junxi	junctum	jungere	*join.*
Laedō	laesī	laesum	laedere	*hurt.*
Al-lĭcĭō	allexi	allectum	allicere	*entice.*
Ē-lĭcĭō	ēlicŭī	ēlicĭtum	elicere	*entice out.*
Lūdō	lūsī	lūsum	ludere	*play.*
Mergō	mersī	mersum	mergere	*sink* (tr.)
Mittō	mīsī	missum	mittere	*send.*
Nectō	nexī or nexŭī	nexum	nectere	*bind.*
Nūbō	nupsī	nuptum	nubere	*marry* (of a woman).
Pectō	pexī	pexum	pectere	*comb.*
Pingō	pinxī	pictum	pingere	*paint.*
Plangō	planxī	planctum	plangere	*beat the* *breast.*
Plaudō	plausī	plausum	plaudere	*clap.*
Prĕmō	pressī	pressum	premere	*squeeze.*
Prōmō	prompsī	promptum	promere	*bring out.*
Quătiō		quassum	quatere	*shake.*
Rādō	rāsī	rāsum	radere	*scrape.*
Rĕgō	rexī	rectum	regere	*rule.*
Dīrigō	direxī	directum	dirigere	*direct.*
Pergō	perrexī	perrectum	pergere	*proceed.*
Surgō	surrexī	surrectum	surgere	*rise.*
Rēpō	repsī	reptum	repere	*crawl.*
Rōdō	rōsī	rōsum	rodere	*gnaw.*
Scalpō	scalpsī	scalptum	scalpere	*scrape.*
Scrībō	scripsī	scriptum	scrībere	*write.*
Sculpō	sculpsī	sculptum	sculpere	*carve.*
Serpō	serpsī	serptum	serpere	*crawl.*
Spargō	sparsī	sparsum	spargere	*scatter.*
A-spiciō	aspexī	aspectum	aspicere	*look at.*
Ex-stinguō	exstinxī	exstinctum	exstinguere	*extinguish.*
Stringō	strinxī	strictum	stringere	*draw tight.*
Strŭō	struxī	structum	struere	*build.*
Sūgō	suxī	suctum	sugere	*suck.*
Sūmō	sumpsī	sumptum	sumere	*take.*
Tĕgō	texī	tectum	tegere	*cover.*
Con-temnō	contempsī	contemptum	contemnere	*despise.*
Ting(u)ō	tinxī	tinctum	ting(u)ere	*dye.*
Trăhō	traxī	tractum	trăhere	*drag.*
Trūdō	trūsī	trūsum	trūdere	*thrust.*
Vādō			vādere	*go.*
In-vādō	invāsī	invāsum	invādere	*attack.*
Vĕhō	vexī	vectum	vĕhere	*carry.*
Vīvō	vixī	victum	vivere	*live.*
Ung(u)ō	unxī	unctum	ung(u)ere	*anoint.*
Ūrō	ussī	ustum	urere	*burn* (tr.).

Perfect stem the same as present stem:

Pres.	*Perf.*	*Sup.*	*Inf.*	
cŭō	acuī		acuere	*sharpen.*
Argŭō	arguī	argūtum	arguere	*make clear.*
Bĭbō	bibī		bibere	*drink.*
Con-grŭō	congrŭī		congruere	*agree.*
Dē-fendō	defendī	defensum	defendere	*ward off.*
Ex-cūdō	excūdi	excūsum	excudere	*forge.*
Findō	fĭdī	fissum	findere	*cleave.*
Imbŭō	imbŭī	imbūtum	imbuere	*steep.*
Lambō	lambī		lambere	*lick.*
Lŭō	lŭī		luere	*expiate.*
Mandō	mandī	mansum	mandere	*chew.*
Mĕtŭō	metŭī		metuere	*fear.*
Mĭnŭō	minŭī	minūtum	minuere	*lessen.*
Ab-nŭō	abnŭī		abnuere	*nod refusal.*
Pandō	pandī	passum	pandere	*spread.*
Ex-pandō	expandī	expansum	expandere	*spread out.*
Psallō	psallī		psallere	*play the* *harp.*
Rŭō	rŭī	[rŭitūrus]	ruere	*fall.*
Scindō	scidī	scissum	scindere	*tear.*
Sīdō	sīdī		sīdere	*settle* (intr.).
Solvō	solvī *or* [sŏlŭī	sŏlūtum	solvere	*loosen.*
Spŭō	spŭī	spūtum	spuere	*spit.*
Stătŭō	statŭī	statūtum	statuere	*set up.*
Sternŭō	sternŭī		sternuere	*sneeze.*
Sŭō	sŭī	sūtum	suere	*sew.*
Trĭbŭō	tribŭī	tribūtum	tribuere	*assign*
Ex-ŭō	exŭī	exūtum	exuere	*put off* (clothes).
Ind-ŭō	indŭī	indūtum	induere	*put on* (do.).
Vellō	vellī	vulsum	vellere	*pluck.*
Verrō	verri	versum	verrere	*sweep.*
Vertō	vertī	versum	vertere	*turn* (tr.).
Vīsō	vīsī		visere	*go to see*
Volvō	volvī	vŏlūtum	volvere	*roll* (tr.).

Deponent in perfect:

Fīdō	fīsus sum	fīsum	fidere	*trust.*

FOURTH CONJUGATION.

Perfect formed by adding *s:*

Fulciō	fulsī	fultum	fulcire	*prop.*
Hauriō	hausī	haustum	haurire	*draw, drink.*
Sanciō	sanxī	sanctum	sancire	*ordain.*
Sarciō	sarsī	sartum	sarcire	*patch.*
Sentiō	sensī	sensum	sentire	*feel.*
Vinciō	vinxī	vinctum	vincire	*bind.*

Perfect formed by suffixing *–ui* or *–vi:*

Ăpĕrĭō	ăperŭī	apertum	aperire	*open.*
Ŏpĕrĭō	operŭī	opertum	operire	*cover.*
Săliō	saluī		salire	*jump.*
Dē-sĭliō	desiluī		desilire	*jump down.*
Sĕpĕliō	sepelīvī	sepultum	sepelire	*bury.*

DEPONENT VERBS.

The deponent verbs of the first declension all follow the model of *amor*. We quote here all the deponents of the third conjugation as well as those of the second and fourth, which deviate from the model.

SECOND CONJUGATION.

Pres.	*Perf.*	*Inf.*	
Făteor	fassus	fătērī	*confess.*
Cōnfiteor	cōnfessus	cōnfitērī	*confess.*

THIRD CONJUGATION.

Ăpiscor	aptus	apiscī	*get.*
Expergiscor	experrectus	expergiscī	*awake.*
Frŭor	fructus (fruitus)	frui	*use, enjoy.*
Fungor	functus	fungī	*perform* (*a* *task*).
Grădior	gressus	gradī	*walk.*
Īrascor	īrātus	īrascī	*be angry.*
Lŏquor	lŏcūtus	loquī	*talk.*
Com-miniscor	commentus	comminiscī	*contrive.*

Pres.	*Perf.*	*Inf.*	
Rĕ-minīscor		reminiscī	*recollect.*
Nanciscor	nactus *or* nanctus	nanciscī	*get.*
Nascor	nātus	nascī	*be born.*
Nītor	nīsus *or* nixus	nītī	*rest upon, strive.*
Oblīviscor	oblītus	oblīviscī	*forget.*
Păciscor	pactus	paciscī	*make a compact.*
Pătior	passus	patī	*allow.*
Am-plector	amplexus	amplectī	*embrace.*
Prŏficiscor	profectus	proficiscī	*start, set out.*
Sĕquor	secūtus	sequī	*follow.*
Ulciscor	ultus	ulciscī	*revenge.*
Ūtor	ūsus	utī	*use.*
Vescor		vescī	*feed oneself.*

FOURTH CONJUGATION.

Assentior	assensus	assentirī	*assent.*
Expĕrior	expertus	experirī	*try.*
Mētior	mensus	mētirī	*measure.*
Ordior	orsus	ordirī	*begin.*
Orior	ortus	ŏrirī	*rise.*

IMPERSONAL VERBS.

Those verbs are called impersonal in which the doer is left out of the question, and the action or state expressed by the verb alone insisted upon. Impersonal verbs always appear in the third person singular, and undergo no inflection of number or person, though they have tense and mood inflections. The majority of impersonal verbs have no definite subject, and when they are translated into English, the pronoun "*it*" precedes them—*e.g.*, **tonat**, *it thunders.* Some few, however, such as *decet*, *oportet*, &c., which are generally described as impersonal verbs, have as their subject a neuter pronoun (cf. English "it" in *it snows*, *it behoves*), an infinitive, or a whole sentence.

The following are the main classes of impersonal verbs:

(1) Verbs which express the state of the weather or relate to atmospheric phenomena. Examples :—

IMPERSONAL VERBS RELATING TO ATMOSPHERIC PHENOMENA.

Dīlūcŭlăt, *it dawns.*
Fulgŭrăt, *it lightens.*
Fulmĭnăt, *it strikes with lightning.*
Gĕlat, *it freezes.*
Grandĭnăt, *it hails.*
Lūcescit, *the day breaks.*
Ningit, *it snows.*
Noctescit, *the night approaches.*
Plŭit, *it rains.*
Tŏnat, *it thunders.*
Vespĕrascit, *it grows dark*, or, *evening comes on.*

(2) Verbs, which express states of mind, necessity, &c. The majority of these belong to the second conjugation.

Pres.	*Perf.*	*Inf.*	
Misĕret		miserēre	*it moves to pity.*
Piget	pigŭit	pigēre	*it vexes.*
Paenitet	paenitŭit	paenitēre	*it repents.*
Pŭdet	pudŭit	pudēre	*it shames.*
Taedet	taedŭit *or* pertaesum est	taedēre	*it wearies.*
Dĕcet	decŭit	decēre	*it is becoming.*
Dedĕcet	dedecŭit	dedecēre	*it is unbecoming.*
Lĭbet	libŭit	libēre	*it is pleasing.*
Lĭcet	licŭit	licēre	*it is allowed.*
Ŏportet	oportŭit	oportēre	*it behoves.*

Strictly speaking, ***miseret***, ***piget***, ***paenitet***, ***taedet***, and ***pudet***, are the only impersonal verbs of this class, for the others given in the above list may all have a pronoun, infinitive, or sentence as their subject. However, they are in a sense impersonal, and they may properly be regarded as such. The construction of these quasi-impersonal verbs presents no great difficulty, but a word or two must here be said concerning the construction of the five strictly impersonal verbs belonging to this class. They are followed by an accusative of the person and a genitive of the thing which produces the mental state denoted by the verb. It must be remembered that these impersonal verbs should be translated into English by personal verbs, as the use of impersonal verbs is foreign to the English idiom. The following examples will help you to understand these points :—

Neque te mei tergi miseret.	*You feel no pity for my back.* Lit., *it does not distress you concerning my back.*
Fratris me piget.	*I am vexed with my brother.* Lit., *it vexes me concerning my brother.*
Te tuae laudis non paenitet.	*You are not sorry for your own praise.* Lit., *it does not repent you on account of your praise.*
Multos homines vitae taedet.	*Many men are weary of their life.* Lit., *it disgusts many men concerning life.*
Me pudet tanti mali.	*I am ashamed at such an evil as that.* Lit., *it shames me concerning such an evil.*

(3) Besides the impersonal verbs which we have mentioned, there are a large number of others which occupy a position half-way between personal and impersonal verbs. They are merely the third person singular of personal verbs, and have either an infinitive or a sentence as their subject. Such as **accidit**, *it happens* ; **convenit**, *it is agreed* ; **constat**, *it is acknowledged*, &c.

(4) The third person singular of passive verbs is frequently used in an impersonal sense : *e.g.* —

Sic itur ad astros.	*Thus people reach the stars.* Lit., *thus it is gone to the stars.*
Bibitur *or* bibitum est.	*Drinking is going on.*

DERIVATIVE VERBS.

There yet remain to be considered several classes of verbs, each of which classes has a special termination and a special meaning. Their conjugation presents no difficulty, so we shall only give one or two examples of each class.

Desiderative.—Desiderative verbs are formed by adding *-urio* to supine stems, and they express *a desire.* They are all of the fourth conjugation, and are conjugated on the model of ***audio.*** **Examples** :—**es-urio**, *I desire to eat—i.e., I am hungry* ; **script-urio**, *I desire to write.*

Inceptive.—Inceptive verbs (also called ***inchoative***) are formed by suffixing *-sc-* or *-isc-* to the stems of verbs. They denote a beginning or becoming. As we should expect from their meaning, they rarely have a perfect or supine, but use the perfect and supine of the verb from which they are derived. Though they are formed from verbs of all the conjugations, the majority of them are derived from verb-stems in *e*—*i.e.*, from verbs of the second conjugation. They are all conjugated on the model of *lego*, except that, as before mentioned, they borrow their perfect and supine from the simple verb. Examples: — **laba-sc-o**, *I begin to totter*, from **laba-re**, *to totter;* **palle-sc-o**, *I grow* or *turn pale*, from **pallere**, *to be pale;* **arde-sc-o**, *I become inflamed*, from **arde-re**, *to burn;* **(ob) dormi-sc-o**, *I fall asleep*, from **dormi-re**, *to sleep*.

Frequentative.—Frequentative verbs, which denote a constant repetition of an action, are formed by adding *-ito* to the present stem of verbs, from which the vowel, if there is one, has been dropped, or from the supine stem. Frequentative verbs are always of the first conjugation, and are therefore conjugated like *amo*. Examples:—**clamito**, *I shout loudly* or *frequently*, from **clamare**, *to shout;* **rogito**, *I keep on asking*, from **rogare**, *to ask;* **cantito**, *I continue to sing*, from **cant-**, the supine stem of **canere**, *to sing*.

Intensive.—Intensive verbs, which express intense or repeated action, are formed directly from the supine stems of verbs by adding *o*, the inflectional ending. Like frequentative verbs, from which they hardly differ at all, they are of the first conjugation. Examples:—**cant-o**, *I sing much*, from **cant-**, the supine stem of **canere**, *to sing;* **curs-o**, *I keep on running*, from **curs-**, the supine stem of **currere**, *to run*.

IRREGULAR VERBS.

You have now had set before you the conjugation of the regular verbs and the principal parts of all those verbs which, though their perfect and supine stems deviate from the model, can be easily conjugated when their principal parts are known. There now remain to be studied a few irregular verbs, which deviate according to no fixed rule, but which must be learnt one by one. Some of them form their tenses from more than one stem, others undergo changes of form peculiar to themselves. You will notice that the majority of these irregular verbs express quite simple ideas, and are, in fact, the verbs most commonly used in the language of everyday life. This will be found to be the case in all languages. The simplest and oldest verbs are always the most irregular. In Latin the tenses of the verb **esse**, *to be*, are formed from several roots, and, similarly, in English the tenses of the verb *to be* are formed from no less than three roots. This proves to us one interesting point—that languages in their earlier stages have an abundance of verb stems, which express nearly the same ideas. Then by degrees one tense is dropped out of one verb, another from another, and finally we get verbs such as the Latin *esse* or the English *to be*, the tenses of which are formed from several stems. You have already learnt how to conjugate *sum*, we will therefore proceed to set before you the conjugation of some other irregular verbs.

1. Possum, *I am able.*

Chief Parts: Possum, potui, posse.

Possum consists of potis, *able*, and sum, *I am*. The potis is contracted into the stem po*t*, and po*t* before the *s* in sum becomes po*s;* whence comes pos-sum.

INDICATIVE MOOD.

	PRESENT.	IMPERFECT.	PERFECT.
Sing.	Pos-sum.	pot-ĕram, etc.	pot-ŭi, etc.
	Pŏt-ĕs		
	Pŏt-ĕst		
Plur.	Pos-sumus		
	Pŏt-estis		
	Pōs-sunt		

PLUPERFECT.	FUTURE.	FUTURE PERFECT.
Pŏt-ŭĕram, etc.	pŏt-ĕrō, etc	pŏt-uĕrō, etc.

SUBJUNCTIVE MOOD.

PRESENT.	IMPERFECT.
Pos-sim, etc.	pos-sem, etc.

PERFECT.	PLUPERFECT.
Pŏt-ŭĕrim, etc.	pŏt-ŭissem, etc.

IMPERATIVE MOOD.

(*None.*)

INFINITIVE.

PRESENT.	PERFECT.	FUTURE.
Pos-sĕ	pŏt-ŭissĕ	(*none*)

PARTICIPLE.

PRESENT.

Pŏt-ens (only as an adjective, *powerful*).

The tenses which are not given in full here present no difficulty, and do not differ at all from similar tenses of the verb **esse**, *to be*. For instance, *poteram*, the imperfect of *possum*, resembles throughout *eram*, the imperfect of *sum*.

2. Dō, *I give.*

Chief Parts: Dō, dĕdī, dătum, dărĕ.

INDICATIVE MOOD.

PRESENT.	IMPERFECT.	PERFECT.
Dō, etc.	dăbam, etc.	dĕdī, etc.

PLUPERFECT.	FUTURE.	FUTURE PERFECT.
Dĕdĕram, etc.	dăbō, etc.	dĕdĕrō, etc.

SUBJUNCTIVE MOOD.

PRESENT.	IMPERFECT.
Dem, etc.	dărem, etc.

PERFECT.	PLUPERFECT.
Dĕdĕrim, etc.	dĕdissem, etc.

IMPERATIVE MOOD.

Sing.	Dă, dăto.	*Plur.*	Dătĕ, dătōtĕ.
	Dăto.		Dantō.

INFINITIVE.

PRESENT	PERFECT.	FUTURE.
Dărĕ	dĕdissĕ	dătūrum esse.

PARTICIPLES.

PRESENT.	FUTURE.
Dans	dătūrus.

GERUND.		SUPINE.	
N. Acc.	Dandum.	*Acc.*	Dătum.
Gen.	Dandī.	*Abl.*	Dătū.
Dat.	Dandō.		
Abl.	Dandō.		

In early writers a peculiar form of the present subjunctive of *do* is found, namely, *dŭim*, *dŭīs*, etc.

Do is conjugated in the passive, but the student should, with the active voice before him, find no difficulty in inferring the passive.

3. Vŏlō, *I wish*.

Chief Parts: Vŏlō, vŏlŭi, vellĕ.

INDICATIVE MOOD.

	PRESENT.	IMPERFECT.	PERFECT.
Sing.	Vŏlō	vŏlēbam, etc.	vŏlŭī, etc.
	Vīs		
	Vult		
Plur.	Vŏlŭmŭs		
	Vultĭs		
	Vŏlunt		

PLUPERFECT.	FUTURE.	FUTURE PERFECT.
Vŏlŭĕram, etc.	vŏlam, vŏlēs, etc.	vŏlŭĕrō, etc.

SUBJUNCTIVE MOOD.

PRESENT.	IMPERFECT.
Vĕlim, etc.	vellem, etc.
PERFECT.	**PLUPERFECT.**
Vŏlŭĕrim, etc.	vŏlŭissem, etc.

IMPERATIVE MOOD.

(*None.*)

INFINITIVE.

PRESENT.	PERFECT.
Vellĕ	vŏlŭissĕ.

PARTICIPLE.

PRESENT.
Vŏlens.

GERUND.

N. Acc.	Vŏlendum.	*Dat.*	Vŏlendō.
Gen.	Vŏlendī.	*Abl.*	Vŏlendō.

TRANSLATION.

OVID, "FASTI," IV., LINES 811 ET SEQ.

The following passage is taken from the same work of Ovid as the last, and describes the way in which Romulus and Remus chose the site for the future city of Rome. The legend tells us how, when the brothers grew up, they left their grandfather Numitor reigning at Alba Longa, and set out to found a city of their own. They agree to choose the place for the city by watching the flight of birds, and by this method Romulus is appointed as the founder. *He begins to mark out and build the walls, and Remus in contempt leaps over them and is slain:—*

"Contrahere agrestes et moenia ponere utrique
Convenit; ambigitur, moenia ponat uter.
'Nil opus est,' dixit 'certamine,' Romulus, 'ullo.
Magna fides avium est; experiamur aves.'
Res placet: alter init nemorosi saxa Palati,
Alter Aventinum mane cacumen init.
Sex Remus, hic volucres bis sex videt ordine: pacto
Statur, et arbitrium Romulus urbis habet.
Apta dies legitur, qua moenia signet aratro.
Sacra Palis suberant, inde movetur opus.
Inde premens stivam designat moenia sulco;
Alba jugum niveo cum bove vacca tulit.
Ille precabatur; tonitru dedit omina laevo
Juppiter, et laevo fulmina missa polo.
Augurio laeti jaciunt fundamina cives,
Et novus exiguo tempore murus erat.
Hoc Celer urget opus, quem Romulus ipse vocarat;
'Sintque, Celer, curae,' dixerat, 'ista tuae:
Neve quis aut muros, aut factam vomere fossam
Transeat; audentem talia dede neci.'
Quod Remus ignorans, humiles contemnere muros
Coepit et, 'His populus,' dicere, 'tutus erit?'
Nec mora, transiluit. Rutro Celer occupat ausum;
Ille premit duram sanguinolentus humum."

---

1. *Contrahere.* This inf. and *ponere* depend on the impersonal verb *convenit*, "it is agreed upon for (*i.e.*, by) both."

   Notice that *convenit* and all the verbs in the first twelve lines are present tenses used to describe past events (the so-called Historical Present).

2. *Ambigitur.* The order is *ambigitur uter ponat moenia*, "which of the two should build the walls."

3. *Nil opus est.* "There is no need of," takes an ablative, as here *certamine*.

4. *Fides.* "Belief in," "reliance on." The Romans never decided on any important step without taking omens in some way or other. They frequently employed augury — for example, they watched the flight of birds, and from their direction, &c., judged whether any enterprise should be undertaken or not.

5. *Alter.* Romulus. The Palatine Hill was supposed to have been the site of the earliest settlement. Later, Rome was extended to the famous "Seven Hills."

6. *Mane.* "In the morning," an indeclinable subst. used adverbially.

7 *Hic.* Romulus. *Ordine.* "In a line." Remus saw six birds first, but Romulus saw twelve, and this was considered a better omen.

8. *Statur.* The passive of *sto* is here used impersonally. "It is stood by the agreement"—we should say "They stand by."

9. *Qua signet.* "On which he may mark." The subjunctive mood here expresses purpose.

10. *Sacra Palis.* "The feast of Pales," an Italian deity, whose feast the Palilia was connected with the foundation of Rome.

 Inde. "From this (time) the work is started."

11. *Premens stivam.* "Pressing"—*i.e.*, holding—"the plough handle." These lines describe the way in which the *pomoerium* (the line marking the circuit of the city) was drawn. This method of founding towns is said to have been derived from the Etruscans.

13. *Tonitru laevo.* "Thunder on the left hand." The left side was always regarded as the side of favourable omen.

14. *Missa—i.e., sunt.* "Bolts were hurled from the left quarter of the heaven."

15. *Augurio laeti.* "Joyful at the augury the citizens lay the foundations."

17. *Celer.* A legendary character, who was supposed to have assisted Romulus.

 Vocarat. Shortened form of *vocaverat*, "had so called"—*i.e.*, Romulus had given him the name of Celer (Swift).

18. *Curae tuae.* "May they be thy care." This use of the dative, "for a care," is called the Predicative Dative.

19. *Neve quis.* "And let not anyone."

20. *Audentem talia.* "The man daring such things do thou deliver over to death."

21. *Quod*, governed by *ignorans.*

22. *Coepit* governs both *contemnere* and *dicere.*

23. *Nec mora—i.e., erat.*

 Occupat. "Anticipates"—*i.e.*, prevents.

 Ausum. "Him having dared"; *audeo* is an irregular verb with a perfect, *ausus sum*, which is deponent in form.

24. *Ille.* Remus. *Premit humum.* "Presses the ground"—*i.e.*, bites the dust.

KEY TO TRANSLATION FROM OVID (p. 8).

When Amulius, the despiser of justice, learnt this news, for being the victor he had snatched the power from his brother, he ordered the boys to be brought and put to death in the river. What think you? (*Lit.*, what do you make of it?) One of them will be Romulus. The attendants unwillingly perform the sad commands. Still they weep, as (*lit.*, and) they carry the twins to the appointed spot. The Albula, to which Tiberinus, drowned in its waves, had given the name Tiber, was by chance full with winter streams. When they came to this spot, and could not advance any farther, one or other of them says, "But how like they are! How beautiful each one is! Yet of the two that one has the more strength. If descent is shown in the face, unless the likeness deceives me, I suspect that some god or other is your father. But if a god were author of your being (surely) he would bring aid in so dangerous a time. Certainly he would bring aid, if the mother had not needed his help, who in one day became a mother and was robbed of her children. Poor creatures (*lit.*, bodies), born to perish at the same moment, go beneath the waves." He had ceased and put down (the children) from his breast. They cried with the same voice; you might think that they could feel; the servants (*lit.*, these) return to their homes with cheeks wet. The hollow cradle bears them up on the top of the water. Alas! What mighty fortunes a small plank holds!

DRAWING.—VIII.

[*Continued from p.* 14.]

SHADOWS (*continued*).

THE need of thoroughness, on which we have insisted so strongly in the chapter treating of the laws of perspective (Vol. I., p. 70), is equally necessary here. If our readers will take the trouble not only to learn to draw shadows correctly, but also to understand the principles on which they are founded, they will have added tenfold to the interest of their studies and obtained a complete, instead of a merely superficial, knowledge of this branch of art. We hope, therefore, that our pupils will be anxious to accompany us into a little inquiry respecting the laws which regulate the disposition of shadows as they occur under various circumstances. The extent of the shadow is ruled by the position of the source of light. On any day at noon, when the sun is high in the heavens, the shadows of our own figures are shorter than in the morning or evening, when the sun is lower: this, then, suggests the consideration, how are we to regulate or decide upon the extent of the shadow of an object in a picture according to the sun's inclination? This may be said to be the statement of the question relating to all shadows under whatever conditions they may be found. We propose now to take it up with reference to a few cases only, as it will be more thoroughly answered in the lessons on Geometrical Perspective.

Sometimes the position of the sun may be behind us, at other times before us, and again it may be, as it is technically termed, "in the picture;" that is, the sun is either on our right hand or on our left, meaning by that neither before us nor behind us: consequently the rays are parallel with the picture. Sometimes the source of light is a lamp or candle, and although the rules for constructing the shadows under this light are very much the same as those we employ for shadows resulting from the effects of sunlight, yet there is this characteristic difference: the sun's rays are always considered to be parallel on account of its remote distance from the earth, whilst the light from a lamp or candle radiates above, below, and on all sides, and consequently the rays are not parallel. Figs. 76, 77, and 78 are intended to show the position of the shadow of an object in three cases. In Fig. 76 the sun is parallel with our position, or with the picture plane, and is on our right hand, casting the shadow of the pillar at A B, which is parallel with the horizontal line and picture plane. In Fig. 77, when the sun is in front of the picture, or behind us, the shadow is cast in a retiring position. In Fig. 78, when the sun is behind the picture or before us, the shadow is cast in advance of the object, or, in other words, approaches us. We intend to give only a single geometrical example, and that a very simple one, of the first of these positions, and leave the pupil at present to take for granted much that might be said, not only on this position, but on the others also, as they belong more especially to geometrical perspective. The position we have chosen is the *parallel* position, when the sun's rays are in the picture. Let A, B (Fig. 79) represent two walls, forming a right angle, one of which, A, is parallel to the picture plane, and the other, B, at a right angle or perpendicular with the picture plane; there is also a doorway in the wall B. Let the sun's rays be supposed to have an inclination of 45°. The angle *a b c* (45°) may be made anywhere on the ground line, as it is only so placed for the purpose of drawing the lines, *d c*, *f g*, etc., parallel to *a b*, to ensure the given inclination of the sun's rays, by which the extent of the shadows are determined. Our purpose, then, in introducing this problem is to prove that the edges of the shadows of objects in a horizontal position have the *same vanishing point* as the lines of the object itself have when in parallel perspective. It will be seen that the shadow *g h* of the upper edge of the wall B, as well as the wall itself, are directed towards the *point of sight*, also the shadow of the top of the doorway, and *e i*, of the end of the wall A, are subject to the same rule. We should like to go further into this very interesting inquiry, but refrain from a desire not to present too many difficulties at present. Fig. 80 is an example of the rule set forth by Fig. 79. It will be observed that the dotted lines representing the sun's inclination determine the extent of the cast shadow of the buildings on the ground; and according to the heights of the buildings, so is the extent of their shadows: the shadow of the chimney is on the roof, which being above the eye cannot be seen. Let us again remind the pupil that the tone of the cast shadow on the ground is darker than the broad shadow on the walls. Observe when the shadow of a perpendicular object is cast horizontally on the ground, and is found to be equal in length

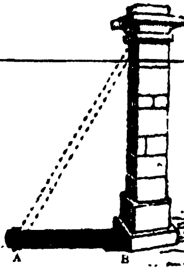


Fig. 76.

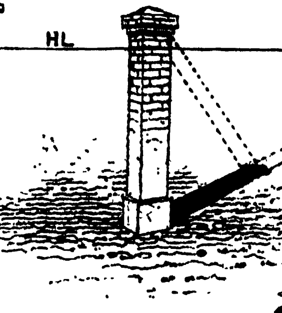


Fig. 77.

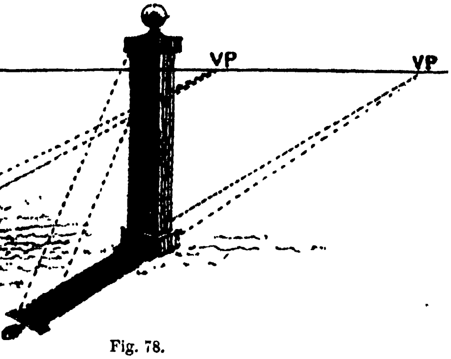


Fig. 78.

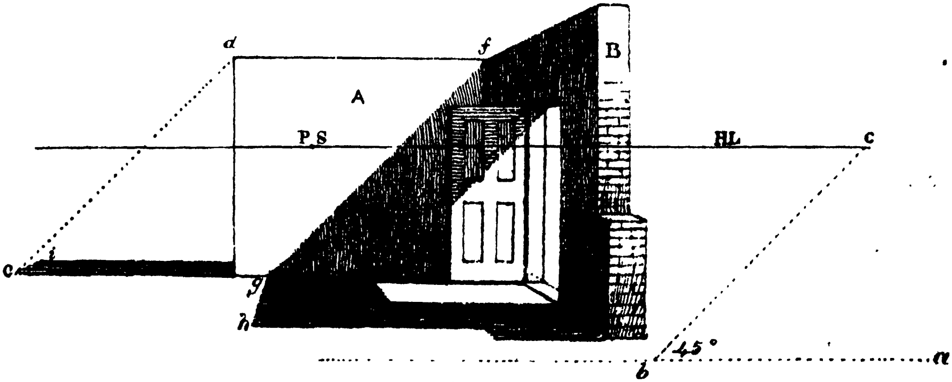


Fig. 79.

to the height of that object, then the inclination of the sun's rays is at an angle of 45°. Therefore. to determine the extent of a shadow caused by the sun's inclination at 45°, we have simply to make the object and its shadow of the *same* length; should the sun's rays be at any other angle, the method, as shown in the problem Fig. 79, of first constructing the angle, must be adopted. The dotted horizontal retiring lines from the shadows in Fig. 77 and Fig. 78 meet on the H L, or *line of sight*, at the vanishing point of the sun's *direction*; whilst the inclined dotted lines from the top of the post to the extremity of the shadow are drawn from the vanishing point of the sun's *elevation*, in one case *above*, in the other *below*, the line of sight. We merely mention this, and purposely decline giving any further rules at present for the construction of shadows, asking the pupil patiently to wait until he is a little more advanced for fuller and more direct information, with a promise on our part that he shall not be left without proof and further instruction upon these interesting points. In the case of Fig. 81 the sun is behind us to the left, and therefore in front of the picture; cast shadows are thrown upon the projecting walls and on the ground: this hint will remind the pupil of their difference of tone. In *working* a shadow cast on the ground we recommend the practice of drawing the lines of the shadow (that is, the shading) *horizontally*, so that the retiring shadows will then appear *horizontal* on a like surface: if the lines of the work were drawn in the direction of the vanishing point to which the shadow retires, the shadow would then appear to be *inclined* to the horizon, similar to the roof of a house, or to a board placed upon an edge and leaning against a wall. Cast shadows on perpendicular planes, such as upright-walls, should be worked more or less *perpendicularly*. As a general rule, we may decide that the working of a shadow should always be with especial reference to the position or inclination of the object upon which it is cast, whether it be perpendicular, horizontal, or inclined, so that the lines of the shading, though representing the shadow, should also represent the character of the ground, object, or plane upon which the shadow is cast.

We have so far dwelt altogether upon the treatment of shadows, which belong more especially to flat surfaces, as they come more commonly under our general observation, and are found to be under the most simple conditions. For flat shadows—namely, those on the sides of walls, or on the ground—we have employed straight lines only, without crossing them with other straight lines, and thus produced either dark or light shades by making the lines broader, or closer together, or wider apart, as the tone of the shadow required; but with rounded forms we must adopt the practice of crossing lines by others, straight lines by straight, and curved lines by curved, making the lines to *follow the course of curvature*, which, independently of the tone employed, materially assist us in producing the effect of rounded forms. The first example will be a *flat tint*, for which the pupil must use a B or B B pencil with a tolerably broad point. Fig. 82 is a series of regular perpendicular lines crossed over with inclined lines at a very acute angle with the perpendicular; the angle of inclination may be understood by referring to the crossed lines, *a* (we caution the pupil at present against crossing the lines at right angles, thereby producing a kind of rectangular network); this first example must be repeated over and over again until it is mastered. The first difficulty will be to draw the lines equidistant from each other, so that the intervals between them be uniformly regular, both with regard to the first-drawn perpendicular lines and those which cross them. In the next place, the beginner will at first be almost certain to make some of his lines broader, some darker than others. To avoid this, he must endeavour to use equal pressure; and then again, probably, they will not be parallel with each other. To overcome all these little impediments to progress he will require very considerable practice before he should think of attempting the next step in shading, which differs from that already explained in the *manner* of drawing the line.

It should be noticed that in Fig. 82 the learner ought to place the pencil upon the paper before he begins to draw each line, nor should it be taken off until the line is finished. The kind of line we are now considering is one that must have no perceptible beginning or ending, where the pencil either commences the movement for drawing the line *before* it touches the paper, as *a* (Fig. 83), or as *b*, where, at the termination, the pencil is gradually raised from the paper; or as *c*, where the manner of *a* and *b* is combined—that is, where the line commences imperceptibly and ends imperceptibly, first, by lowering the pencil in an inclined direction to the paper at the commencement, and by raising it gradually at the end before leaving off, so that the *strength* of the line when completed is in the *middle*. Curved lines drawn in the same way must also be repeatedly practised. The straight lines (Fig. 82) are for flat tints, backgrounds, etc.; the curved lines are employed for rounded forms.

After the pupil has mastered the manner of drawing these various kinds of line, he may then proceed to cross them, as in Fig. 84, observing, again, that he must not as yet cross them at right angles.

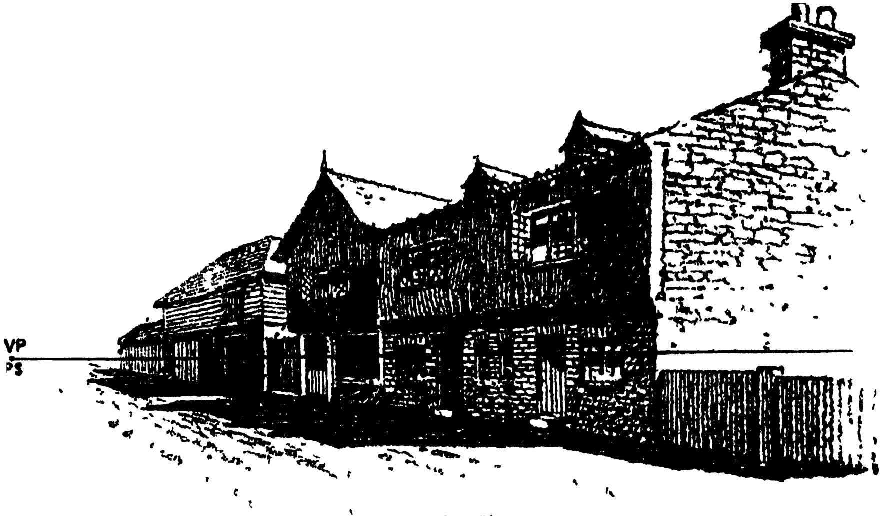
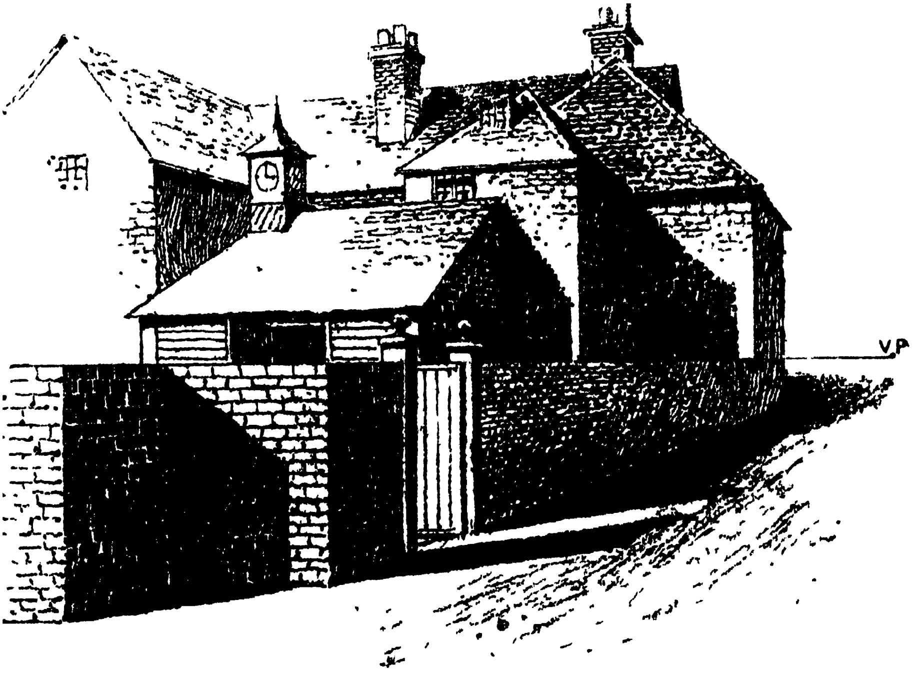


Fig 80



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Perhaps he may ask, why not *as yet*, is there any decided objection to lines crossed at right angles? Certainly not, when done by an experienced hand; but the reason why we object to his crossing them in that way at present is because he will have first to acquire the power of making all his lines *equal* in *tone*, *thickness*, and *strength*, and at regular intervening distances; and this we know will demand all the thought and care he can bestow for a while before he must attempt to cross them in *any* direction.

The reason for commencing the line (as shown at *b*, Fig. 83) firmly, and then gradually lifting up the pencil when drawing lines for an even tint of shade of some extent, is, that we may continue the line by the manner of *c*, so that the extremities of these lines as they lap over one another may form an even line without any perceptible joint. Very probably it may be necessary to repeat the example *c* many times successively (but this depends upon the extent of the shadow), and then we finally end with the example *a*. Let the pupil draw a square of about four or five inches' side, and fill it up by this method of making an even shade tint. If he were to work the whole space with continued portions similar to Fig. 82, the joints of these portions would show, and spoil the tint; the edge, *b c* (Fig. 82), would be shown across the shadow as many times as the portion was repeated.

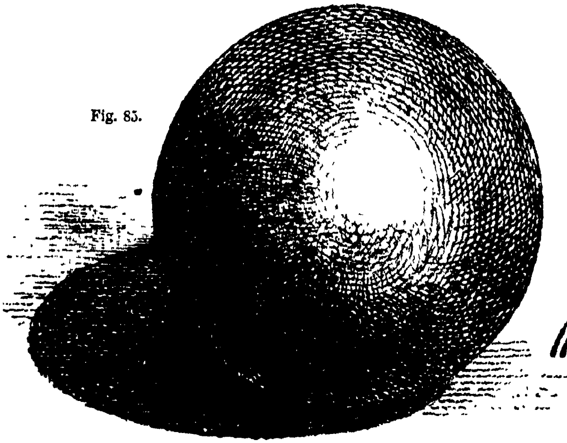
Believing the pupil now to be master of the method of drawing a single line under any one of the conditions above named, whether straight or curved, we will proceed to apply them, or rather to combine them, so as to form tints required in shading. Of course we can do little for the pupil towards helping him in his judgment regarding the tones of shadows; his own observation must be his guide in deciding how dark or how light a shadow is. Shadows and tones must be compared with one another, because the circumstances surrounding them will so far influence their intensity that it would be impossible to give rules for shadows under all conditions. They are so varied and so changeable that we can do no more than give him a few general principles.

We have said before that cast shadows are, for certain reasons already given, generally darker than broad shadows; we will add now that the *highest light* and *darkest shadow* are *together;* and as the strength of the light upon an object or collection of objects gradually diminishes, so the depth or intensity of the shadows diminishes also. Take an example:—Place a chair near to a window, and another chair in the part of the room farthest from the window; the light which falls upon the chair near to the window will be much stronger than that which falls upon the farther chair. Observe the broad shadows and the cast shadows from the legs upon the ground, the latter especially, of the first chair. Compare them with the corresponding shadows of the second chair, or that farthest from the window. We venture to say, without more comment, that the pupil will have seen enough from this experiment to satisfy him upon this point. This principle of the darkest shadow being near to the highest light is found to be the same respecting the shadow *on* a ball (Fig. 85), or *on* the side of a column (Fig. 86), and in thousands of cases besides, so numerous that we need not look far for examples. The great difficulty in shading is the management of the half-tints. Anyone can make an extreme shade of black; and if the right feeling for half-tints and semi-tones is *not* a natural one—something analogous to that of a good ear for music—it *can be* to a great extent acquired, though in some cases it will demand a much greater amount of practical experience and observation than in others before the many varieties of tone which are spread upon the surface of an object, especially if it be an irregular one, become perceptible. Cultivate above all, as we said when first entering upon this subject, the habit of looking for these values; by constantly contrasting one tone with another the eye will learn to detect differences to which at one time it was quite insensible. Study this both from nature and from the works of artists who excel in chiaroscuro (the distribution of light and shade), and give earnest attention to it as it is given here in its most simple form in these lessons, remembering how greatly it will enter into all later work with the pencil and the brush.

As Barnet well remarks, "The management of light and shade, as relates to a whole. ought to be always present in the student's mind. as it is from inattention to this alone that a work is often destroyed in its progress."

It will be readily seen, on referring to Figs. 85 and 86, where curved lines in working the shadows are used in preference to straight ones, and, on the contrary, where straight are preferred to curved; *curved* lines must be used to represent *curved* surfaces, either convex or concave. The ball (Fig. 85) is altogether shaded by curved lines, which render such important service in giving effect to rounded forms. Straight lines are the principal composing lines of the shadow on the cylinder (Fig. 86). On account of its uniformity of surface, and because it is perpendicular, perpendicular lines are employed; whilst the apparent rotundity of the cylinder is made to depend upon the *tone* of the shadow rather than upon the lines which compose it; the shadow having its reflection, its deep shade, and its half-tint, the last blending into the highest light. As to the proper strength of tone to be given to these portions of the shadow, the pupil must be guided by his own judgment, which the more it is exercised the keener will become his perception of the tone of a shadow or reflection.

Fig. 85.



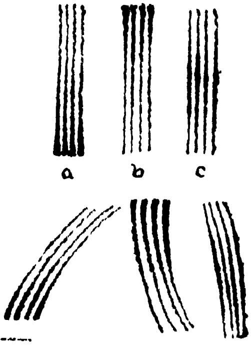


Fig. 83.

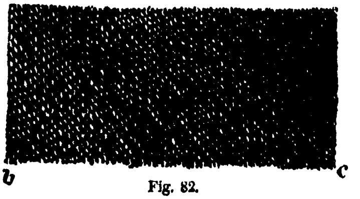
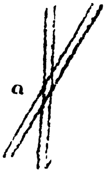


Fig. 82.



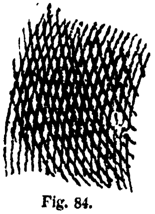


Fig. 84.

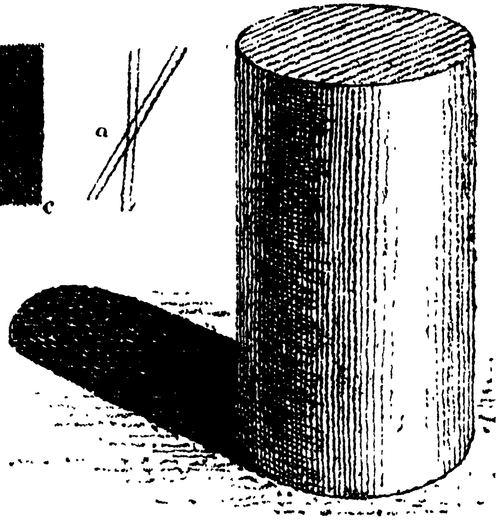


Fig. 86.

"Light and shade," says Barnet, "considered as a means of producing a deception, by making parts of the picture advance and other parts retire, so that everything may keep its relative situation as regards the distance from the spectator, is a necessary attendant upon perspective. It is, however, often violated in the best works for the purpose of giving a general breadth, or of preserving the light in a good shape; but when compatible with both these it is of the utmost consequence, and the painter can enter into a competition with nature only by a perfect knowledge of the best modes of adapting it to such a purpose. Richness of effect, either by a mixture of the light and shade so as to give an appearance of doubling to the outline, or by relieving the outline by a ground possessed of a variety of strengths and distinctness of form, surrounded by flatness, when we wish any part to attract notice, or to preserve the expression undisturbed, are both under the dominion of chiaroscuro."

PHYSICAL GEOGRAPHY.—VIII.

[*Continued from p.* 44.]

MOVEMENTS OF THE EARTH'S CRUST (*continued*).

VOLCANIC phenomena, it is noticeable, occur in marked lines bordering oceans and seas. From Mounts Erebus and Terror, in the Antarctic Continent, along the chain of the Andes, Central America, and the Rocky Mountains, to Mount St. Elias, in Alaska, and the Aleutian Islands; and thence, through the Kurile, Japanese, and Loochoo Islands to Java and New Zealand, the Pacific is encircled by active volcanoes. Jan Meyen, Iceland, and Teneriffe form a line down the North Atlantic, which may be extended eastward through Etna, the Lipari group, and Vesuvius, to Santorin, in the Archipelago, and Demavend, south of the Caspian; and if dormant or recently extinct volcanic regions were taken into consideration, these lines could be made far more strikingly complete. Some of the grandest scenery in the world is the result of now extinct volcanoes and their lavas, such as the Eifel district in Rhineland, the mountains of Auvergne, the Giant's Causeway, the great plains of the Snake River in Oregon, and the flat-topped hills of Southern India.

As to the causes of volcanic action, we can only suggest, in addition to what has been already said about earthquakes (i.) that, in the crumpling that has produced mountain chains, great dislocations or *faults* occur, which might serve as points of weak resistance to the explosive force; and (ii.) that water can penetrate capillary passages even into cavities filled with steam, and under pressure may remain as water even at a white-heat.

Slow Movements of the Land.—Volcanoes are after all, in spite of the grandeur of their eruptions, comparatively local and superficial phenomena. We have evidences, however, of agencies acting far more gradually, but on a far larger scale, in producing changes in the relative levels of land and water. These have been observed in districts exceptionally free from volcanic action. Such are the raised beaches, submerged forests, and probably the coral reefs, of comparatively recent origin, which occur, sometimes remarkably grouped together, in many parts of the world.

Raised Beaches.—Not to dwell here upon such *raised beaches* as have been left by evaporation at considerable heights above the waters of the Dead Sea or the Great Salt Lake, or those so-called "Parallel Roads" of Glen Roy and other Scottish valleys, or Norwegian fjords, which are raised beaches where the water may have been once dammed back by ice, there are many less questionable cases. Spitzbergen is surrounded by beaches, the highest nearly 150 feet above the present sea-level, and similar ones occur along the north coast of Russia and Siberia. At the mouth of the Clyde are similar deposits, in which canoes made by primitive man have been found. There is also direct evidence from measurement that the coast of Sweden north of Stockholm is rising at from six to thirty inches in a century, whilst the southern portion of the peninsula and the south shore of the Baltic is suffering depression. Similarly in Greenland, whilst the shores of Smith Sound are rising, the south-west coast appears to be sinking. The shores of the Mediterranean and the sea-shells in the sands of the Sahara, now in places 900 feet above sea-level, also point to more or less widespread, though recent, elevation; and, if we consider more remote geological times, we have in the west of North America an instance of great and prolonged upheaval.

Submerged Forests.—Evidence of submergence must always be difficult to procure, and mere landslips or the encroachment of the sea by simple wear-and-tear are apt to be mistaken for it. Nevertheless, in addition to the lowering of sea-marks observed in the south of Sweden, many undoubted instances of submerged forests occur, even in our own islands. These collections of tree-stumps with acorns, hazel-nuts, and the bones of forest animals, are found in the Wash; all up the estuary of the Thames and the Lea, as far as Westminster and Walthamstow; in Tor Bay; at the mouth of the Mersey, and elsewhere, leaving no doubt, in many cases, that the trees grew where they now are, so that the level must have changed.

Coral Reefs,—As the polypes which build up coral islands in tropical seas will not live in water more than about twenty fathoms deep, whilst a solid mass of coral (whether forming a *fringing reef* near shore, a *barrier reef* in deeper water, or an *atoll* or circular island in the open ocean) may be observed rising from vastly greater depths, it was argued by Darwin that this fact affords evidence of extensive gradual submergence, the upward growth of the colony of coral-polypes on the remains of previous generations keeping pace with the sinking. This view, however, has been called in question.

The general movements of upheaval and depression thus evidenced were among the reasons which suggested the already-mentioned theory of the existence of a plastic layer beneath the earth's crust; and it has been further suggested that the wearing away of the land by denuding agencies and the deposit of the *débris* on the adjacent sea-floor may to some extent produce these movements, lightening the land and weighting the ocean-bed.

THE WATERS OF THE LAND—SPRINGS AND UNDERGROUND WATER—RIVERS—LAKES.

Of the rainfall of any district (see lesson IV., Vol. I., pp. 211, 212), part is evaporated and passes back into the atmosphere; another portion runs off the surface and forms rivulets, and ultimately rivers; and the remainder sinks into the ground. The proportion which these three parts each bear to the whole rainfall depends upon the heat and dryness of the air, the slope of the ground and its texture, more being evaporated in hot and dry districts, more running off a sloping surface, and more soaking into soft and porous rocks. Rocks, like sand or chalk, that allow water to readily filter through them, are called *permeable;* those, such as clay, which do not, *impermeable.* A comparatively shallow well sunk through a level bed of sand or gravel resting on clay will receive a supply of water from the rainfall of the neighbourhood.

In early times the existence of such water-bearing strata at the surface determined the position of many villages, such as those on gravel-patches that formed the older suburbs of London.

Springs.—Strata are often not horizontal, so that water which has collected in a permeable bed will run off along the surface of an underlying impermeable one, and may issue at the surface. This would be a *gravitation* or *surface spring* (Fig. 40). Such springs are common at the foot of sloping ground. St. Govor's Well in Kensington Gardens, and that in Well Walk, Hampstead, are examples familiar to Londoners.

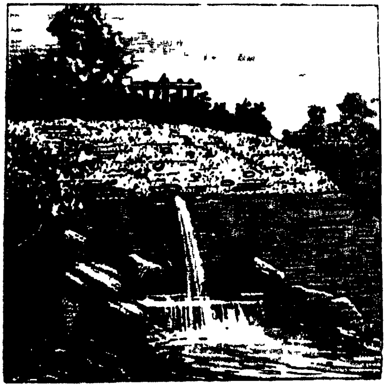


Fig. 40.—Surface Spring.

All rocks, however, are to some extent porous, and are moreover traversed by numerous cracks, down which water can penetrate to a considerable depth. In such cracks water may, after descending to any depth, be again forced upward by hydrostatic pressure, as in a siphon. This is the origin of most *deep-seated springs,* which have sometimes a constantly high temperature, are often largely impregnated with mineral matter, and may derive their water supply from distant areas (Fig. 41). Among such mineral springs some are *brine* springs, containing much salt; others, *chalybeate* (Greek, *χάλυψ, kalūps,* iron), containing iron, which gives them an inky taste and forms a yellow scum, as in that at Well Walk; others, *calcareous* or *petrifying,* encrusting surrounding objects with limestone, as at Knaresborough. Others contain a variety of compounds and are *medicinal;* whilst those that are perceptibly warm are termed *thermal.* The deeper springs are in their origin—*i.e.,* the wider the area over which they obtain their supplies—the less are they affected by temporary droughts or excessive rainfall.

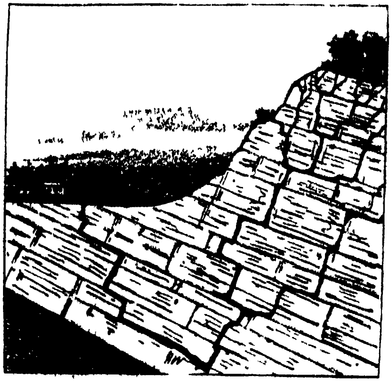


Fig. 41.—Deep-Seated Spring

Underground Water.—All the substances present in spring water have been derived from the solvent action of the water underground. In limestone districts, such as Derbyshire or much of Ireland, this results in the hollowing out of channels and caverns. Water dripping from the roofs of such caverns forms icicle-like pendants of limestone known as *stalactites,* and encrusts the floor with similar masses, called *stalagmite* (Greek, *σταλακτὸς, stălăktos, στάλαγμα, stalagma,* dripping). Another effect of underground water is the production of *landslips,* either by saturating inclined surface-layers, which become top-heavy and slip down, as in the case of the Rossberg, or by forming a loose watery layer or quicksand underneath thick beds of porous rock, which then slide forward over an underlying impermeable bed, as the Chalk has done along the Dorsetshire and Isle of Wight coasts.

Rivers.—Rivers originate in springs, lakes, or glaciers; though there are few lakes which do not have streams running into them as well as an outlet, and a glacier is rather the frozen upper waters of a river than its source. No one spring can usually be properly termed the source of a river, as each tiny rivulet that feeds it will receive its water from one or more distinct springs, but the spring farthest from the mouth is commonly so called. Many springs rise in the bed of a river; but, on the other hand, when a stream is passing over porous rocks it loses water by percolation. In the upper part of its course, which is often among mountains or hills, a stream will generally receive many tributaries, or *affluents*, like itself, draining other slopes; whilst lower down, if its course lies through an extensive plain, its tributaries, though larger, are fewer in number. The whole system of uniting streams, as seen on a map, resembles the branching veins and central mid-rib of a leaf. As each of these streams is flowing down-hill, the area drained by them is necessarily a depression, and it is known as the *river-basin*. The line dividing one river-basin from those of other adjacent rivers is termed the *water-shed* or *water-parting*; but though this line is very often a ridge of high ground, it is not necessarily so, as the levels of the land may have been much altered by wear and tear since the rivers first flowed in their present courses. Many of the rivers of Ireland, for instance, rise in land now at no great height above the sea, but in finding their way to the ocean they cut deep ravines through much higher ground. So too the streams of the south-west of England, separated by low ground in the Weald, cut through the far higher Downs of Chalk which have more successfully resisted the lowering action of atmospheric agencies. (*See* Geography, lesson III., Vol. I., p. 174.) In rare instances the watershed is so much lowered that a stream may flow into two river-basins, as is the case with the Casiquiare, which flows partly into the Orinoco and partly into the Rio Negro, a tributary of the Amazon.

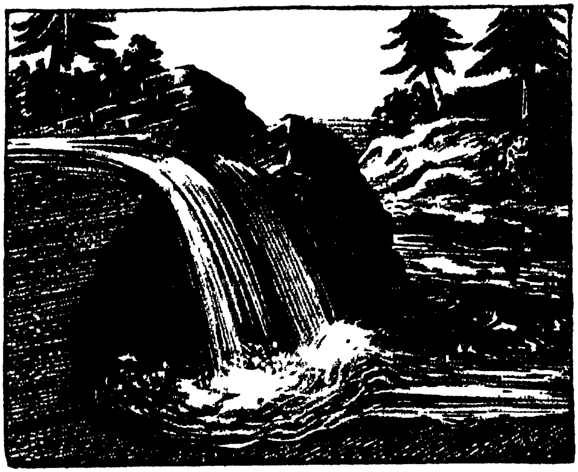


Fig. 42.—WATERFALL AND POT-HOLES.

Mountain Torrents.—The course of a typical river may be divided into three regions, viz., the mountain torrent, the alluvial plain, and the estuary and delta. The mountain torrent has a fairly straight course down the hill-side; it flows in a relatively deep-cut but narrow channel; it leaps over previously existing rock-ledges in cascades; it receives, as we have seen, many small tributaries; and though it rolls many pebbles, and in winter floods even large stones, along its bed, its waters are pure and clear. Such a torrent may have a fall of more than 25 feet in a mile and a velocity of 18 or 20 miles an hour. When two streams unite, though the channel may become both wider and deeper, it is often only the velocity that is increased. Water flowing 10 miles an hour has been known to move stones five tons in weight, and in the eddies of mountain torrents pebbles are often whirled round until cup-shaped hollows, known as *pot-holes*, have been drilled in hard rocks in the river-beds (Fig. 42).

Waterfalls and Rapids.—At the end of its torrential region, or where it passes from a harder on to a softer rock, a river commonly falls abruptly over a *waterfall* into a ravine which it has excavated (Fig. 42). The "Chines" of Hampshire and the "Glens" of Sussex are examples of this on a small scale, as are the Falls of the Rhine near Schaffhaüsen, the Falls of St. Anthony on the Mississippi, or those of Niagara on a vastly larger one. The Niagara river pours, it is estimated, 670,000 tons of water every minute over the Falls, which have a united breadth of 950 yards and a height of 140 to 160 feet Large masses of rock are detached from time to time, so that the Falls are receding at the rate of about a foot in a year, and in this way have excavated a ravine seven miles in length, cutting it backward from Queenstown. If, however, the rate of waste at the top of the fall exceed that at its foot, the rock no longer forms an overhanging ledge, but is worn backwards into a less marked slope, and so passes into the condition of *rapids*, where the river shoots over a rocky channel.

The River in the Plain.—At the foot of a mountain-slope a torrent will suddenly widen out into a broad and shallow stream and will lose much of its velocity. The river now becomes less clear, and it is easily turned aside, and so takes a winding path. It thus becomes impossible to call one bank continuously the north, south, east, or west bank; and it is, therefore, usual to term it the *right* or *left bank*, according as it would be on the right or left hand of a person going *down* the stream—*i.e.*, in the direction of its flow. The velocity of the stream is greatest in the centre and near the surface, where it is free from the friction of its sides and bed, and in rounding the bends in its course it will strike most forcibly against the concave bank. In this way it may not only form *river-cliffs*, but may cut through a bend so as to straighten its course, forming an island, or leaving a crescent-shaped pool of stagnant water shut off by mud. It is in this part of their course that rivers are most liable to floods, those that originate in glaciers experiencing them in summer from the melting of the ice, and other rivers generally during the winter or more rainy season. Rivers which pass through lakes are, however, much less liable to flood, the lake rising perhaps considerably, but - acting as a "flood regulator." When the river-water is spread out over the plain in a comparatively shallow flood it loses much of its velocity, and has therefore no longer the same carrying power. It accordingly drops the fine sediment suspended in it. This forms the *brick-earth* or *loam* by which the *alluvial plain* is imperceptibly raised. More violent floods, such as those produced by the blocking by ice of the mouths of such rivers as those that flow northward into the Arctic Ocean, may carry coarse gravel, and deposit it in considerable thicknesses. Many rivers which have now excavated their valleys to a lower level are flanked by terraces of gravel, known as *high-level gravels*, which mark their flood-level in former ages. These frequently contain the flint implements of primitive man, and the bones of extinct animals which were contemporary with him.

Cañons.—It is important to realise that not only its immediate channel, but often the whole valley through which it flows, though extending far on each side, and rising high above it, has been excavated by the river itself. Possibly this has been effected in part by a greater rainfall in a previous age. Rain slopes the sides of the river valley: in rainless districts they are more nearly vertical, even in soft rocks. Of this the most stupendous examples are the ravines, known as *cañons*, cut by the rivers of western North America (Fig. 43). The Grand Cañon of the Colorado is over 200 miles long. The river flows at the bottom of a gorge with nearly perpendicular walls 3,000 feet high, and 3,000 feet apart. At the top of this chasm a plain extends on either side to the base of similar walls 2,000 feet high, and from five to eleven miles apart; and above these again plains forty to sixty miles broad on either side of the cañon are bounded by terraces, so that a total thickness of 10,000 feet has been cut through and largely removed.

Deltas.—Rivers carry down materials, removed from the areas which they drain, in three different ways. Much mud and large stones may be pushed and rolled along its bed; much soluble matter, such as carbonate of lime, sulphate of lime, and common salt, or chloride of sodium, is carried down in an invisible form, in *solution;* and much finely-divided sediment exists, especially during seasons of flood, in *suspension* in the water. It is computed that the Mississippi carries annually to the sea 7,000 million cubic feet of solid matter; whilst the carrying power of the Ganges during its four months of flood, when it contains one part by weight of sediment in every 428 parts of water, was calculated by Sir Charles Lyell to equal that of "a fleet of more than eighty Indiamen, each freighted with about 1,400 tons' weight of mud, sailing down the river every hour of every day and night." When the river flows into a body of standing water, such as a lake or tideless sea, or when it is met by a contrary current, such as that of the flood tide, its velocity is checked, it loses its carrying power, and its sediment is deposited. The region of a river affected by the flow and ebb of the tides is termed its *estuary.* When the sea is deep and a strong tide sweeps the coast, sediment may not accumulate; but commonly, the wash of the tide is not sufficient to prevent the formation of *sand-banks* and *bars*, as at the mouth of the Thames, or of many Irish rivers. In some cases sediment accumulates so as to gain a large tract at the mouth of the river, and to divide the stream up into many more or less shifting outlets or *mouths*. Such a tract is called a *delta*, because that of the Nile, forming the fertile region below Cairo, projecting into the tideless Mediterranean, is shaped like the Greek capital D, or delta, Δ. Other noticeable deltas are those of the Ganges and Brahmaputra, the Mississippi, the Rhine (forming most of Holland), and the Rhone (south of Avignon). The last-mentioned river has practically a second delta at the head of the Lake of Geneva, where Port Vallais, the *Portus Valesiæ* of the Romans, once on the shore of the lake, is now nearly two miles inland.

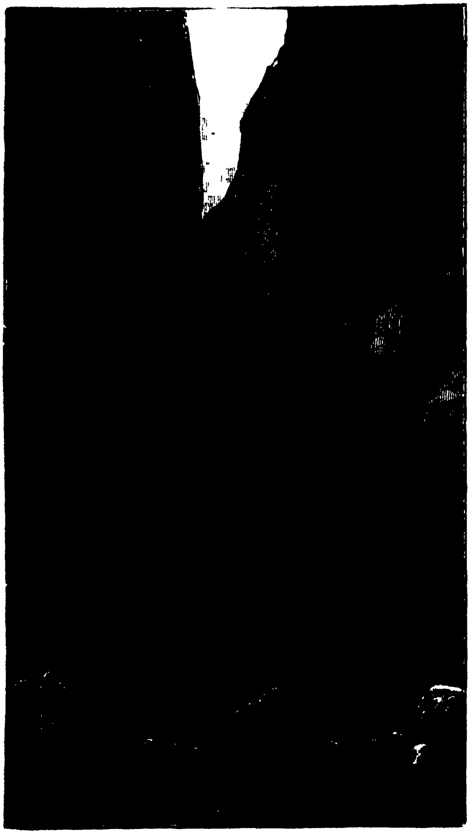


Fig. 43.—Cañon of the Rio Colorado.

Lakes.—Lakes are enclosed pieces of water, with or without a river running out of them. In the first case they are fresh; in the second case almost invariably saline, evaporation necessarily exceeding the inflow of water. Some of these salt lakes may be merely portions of the ocean detached by the elevation of intervening land. The Caspian, for instance, is itself 84 feet below the level of the Black Sea. It covers 126,646 square miles, or about the area of Spain, is 3,000 feet deep, and has living on its shores a variety of the seal of the Atlantic. Near the mouth of the Volga its waters have only one-third the saltness of ordinary sea-water; but the shallow Karaboghas Bay on the south-east is intensely saline. It probably once received the waters of the now isolated Sea of Aral, 117 feet higher, which is fed by the Rivers Oxus and Jaxartes. Lakes are undoubtedly of very diverse origin. Some small circular lakes which neither receive nor send out streams, such as Lake Albano, near Rome, and Avernus, near Naples, are the craters of dormant volcanoes. Near the sea coast we have long, fresh-water, brackish, or salt-water lakes, separated only from the sea by storm-beaches of sand or shingle, known as *lagoons*. Such are Slapton Pool in South Devon, and many similar lakes in the Landes of Bordeaux, Italy, and elsewhere. On the shores of Smith's Sound there are *fjords* blocked by the *débris* brought by floe-ice; and many elongated lakes, such as our own Windermere, occur in valleys whose upper parts either are now or have once been occupied by glaciers, the water-side still showing the scratched and polished surfaces indicating ice-action, and the water itself being dammed back by the glacial moraine. High up among the hills in northern latitudes are hundreds of small basins, known as *tarns*, surrounded by solid rock, and perhaps to some extent due to the scooping action of ice. The highest lakes in the world are Sir-i-Kol, the source of the Oxus, 15,600 feet above sea-level, and the far larger Titicaca in the Andes, 12,800 feet above the sea, which drains into the salt Lago del Desaguero. In Cheshire small pools, or *meres*, are forming by the subsidence of old salt-mines; but the most important of the larger lakes of the world are the result of the subsidence or upheaval of river-valleys on a large scale. The freshwater Lake of Galilee and the saline Dead Sea, over 1,300 feet below the Mediterranean, are on the line of a great *fault*, or fracture in the rocks. The Lake of Geneva, 985 feet deep, and that of Como, which reaches a depth of 1,350 feet, or nearly 700 feet below the surface of the Mediterranean, seem to occupy somewhat similar valleys; and the great lakes of the St. Lawrence—Superior, Michigan, Huron, Erie, and Ontario—lie in a series of submerged cañons. The Great Salt Lake of Utah was once fresh and far deeper, extending over a far larger area, and having an outlet into the Pacific; and similarly the stream from the fresh-water Lake Tchad, in Central Africa, which now loses itself in the desert, once entered a Saharan sea. The enormous fresh-water lakes of Central Africa, Victoria Nyanza, 3,800 feet, Tanganyika, 2,756 feet, and Nyassa, 1,300 feet above sea-level, are depressions on high plateaus, surrounded by lofty mountains; and Lake Baikal, in Siberia, is similarly situated. It is noteworthy that most lakes contain fish and crustacea allied to those of the ocean.

HUMAN PHYSIOLOGY.—VIII.

[*Continued from p.* 18.]

CIRCULATION (*continued*)

THE *arteries* are distributed to all parts of the body. The only portions which are destitute of them are the hair, the nails, the outer covering of the skin, and the cartilages. They divide and subdivide, the branches freely communicating with each other, till they diminish to a very small size, and at length they terminate in a very delicate network of vessels, which from their great minuteness are termed *capillaries* (Lat., *căpillus*, hair). The great artery of the body, called the *aorta*, starts from the left ventricle of the heart, and first ascends, making a kind of arch. It then descends, passing downwards through the thorax and abdomen, at the lower part of which it divides into two. From the arch of the aorta are given off large branches—the *innominate artery*, which divides into the right common *carotid*, and the *right subclavian*. The common carotid ascends on the side of the neck, and divides into the external and internal carotids. From the first of these numerous branches arise, which are distributed to the external parts of the neck, the head, and the face. The internal carotid passes up into the skull, and is the principal channel for the blood going to the brain. The subclavian gives off a large branch, the vertebral, which enters the skull through the occipital foramen, and completes the blood-supply for the brain. It then gives off branches to the shoulder and external parts of the chest, and terminates in a large trunk called the *axillary*, which passes through the armpit, and afterwards, taking the name of *brachial*, passes down the arm to the bend of the elbow, where it divides into the *radial* and *ulnar* arteries, which supply the fore-arm and hand. The left common carotid and subclavian arise directly from the aorta, without the intervention of an innominate artery.

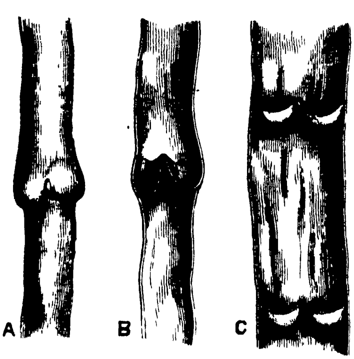


Fig. 21.—VEIN VALVES

A, Vein showing swelling at the situation of a pair of valves; B, Section of ditto, showing the apposition of the Valves when closed; C, Vein cut open and spread out, showing two pairs of Valves.

From the descending trunk of the aorta branches spring which supply all the viscera and the muscular walls of the thorax and abdomen, and eventually the aorta splits into two halves, called the *right* and *left common iliacs*. These each again divide into *external* and *internal* iliacs, the latter of which is distributed to the pelvic organs, whilst the former, taking the name of the *femoral*, at its exit from the abdomen, passes down the front of the thigh, giving off branches to the muscles in that neighbourhood. Two-thirds down it pierces the muscles, and appears at the back of the knee, being there called the *popliteal*. Soon after it enters the leg it divides into two—*anterior and posterior tibial* arteries—which supply the leg and foot. This is the general arterial circulation of the body. In addition to this must be mentioned the *pulmonary artery*, which springs from the right ventricle, and immediately divides into a right and left pulmonary artery. These vessels convey the venous blood to the corresponding lungs, in the substance of which they break up into a dense network of capillaries, which will be more particularly described when we come to speak of the structure of the lungs.

The *capillaries*, or intermediate vessels in which the finest branches of the arteries terminate, are extremely minute, their average diameter being about $\frac{1}{3000}$ of an inch. They vary somewhat in size; those of the brain, lungs, and the intestines are the smallest. These vessels form a dense network all through the body, their number and the closeness of the network being proportionate to the activity of the tissue they have to supply with blood. The walls of the capillaries are composed of a fine transparent membrane, containing cells interspersed at intervals, and offering little obstruction to the flow or passage of the blood-fluid or lymph through their walls. There is no definite line to mark where vessels cease to be arteries and become capillaries, or where the veins commence; but the intermediate vessels have this peculiarity, that when once they have attained a certain degree of minuteness they retain it, and do not continue to diminish, and the meshes of the capillary network are more even and uniform than those formed by the smaller branches of the arteries or the commencing radicles of the veins.

The veins thus take their origin from the capillary network, first as very small vessels, and gradually join together, forming larger and larger trunks, till they are all eventually merged in two, which have been already mentioned, the *superior and inferior cavæ*, ending in the right auricle of the heart. Arteries thus end in capillaries, as veins begin in them, and thus the circulation of the blood is carried out in a continuous series of channels. The veins are larger and more numerous than the arteries, and convey back to the heart the blood which has exhausted its nutritive properties. In structure their walls resemble those of the arteries, but have very little elastic tissue in them. In shape they are not so completely cylindrical as the arteries, and when empty their walls collapse: they also have another important point of difference from the artery, in that there are valves placed in all the larger veins that are subject to much pressure. These valves, which are pockets, semilunar (or " half-moon " like) in shape, generally occur in pairs, and are so arranged as to allow the blood to pass onwards towards the heart, but prevent any backward movement of the current. Veins may be divided into superficial and deep veins and sinuses. The superficial lie immediately beneath the skin, and communicate with the deep ones. The deep veins accompany the arteries, and are usually enclosed in the same fibrous sheath. To the larger arteries, such as the femoral or the subclavian, there is but one vein to each artery; but in the smaller ones, as the radial or ulnar, there are a pair, one lying on each side of the artery. In the brain, and some other parts of the body, the arteries and veins take different courses, and do not accompany each other. The *venous sinuses* only exist in the interior of the skull; they are large channels, formed between the layers of the dura mater, which collect the venous blood from the substance of the brain and discharge it into the internal jugular veins.

Having now examined the blood, and the apparatus by which it is circulated, we pass on to consider the act of circulation itself, and we may take as a starting-point the left ventricle of the heart. When this chamber is filled with blood it contracts and forces the blood into the aorta. This artery conveys it, by means of its many branches, to all parts of the body. When the blood has reached the extreme divisions of the arterial system, it leaves them and enters the capillary network. Thence it makes its way to the veins, which carry it onwards and empty it into the superior and inferior cavæ. These at their termination empty it into the right auricle of the heart. The right auricle, when it is filled, contracts and drives the blood into the right ventricle, which in its turn pumps it into the pulmonary artery. This vessel, dividing into two, conveys it to the lungs. Here, whilst passing through the capillary network of these organs, it is exposed to the action of the air. Leaving the lung, it is conveyed by the pulmonary veins and discharged into the left auricle, which contracting, drives it once more into the left ventricle, to commence again the same unceasing round.

In addition to the general circulation of the body, there is a minor one in the liver, called the portal circulation. This has been before alluded to in the lesson on Digestion. The veins which collect the blood from the organs of digestion join together to form a large trunk, called the *portal vein*. This vessel enters the substance of the liver at its under surface, and divides like an artery into a capillary network, thus bringing the blood it conveys into intimate relation with the secreting cells of the liver. This network terminates in a number of moderate-sized veins called the *hepatic veins*, which finally empty themselves into the inferior vena cava.

We must now consider the part which each constituent of the circulatory apparatus plays in the performance of this function; and first in importance is, of course, the heart. In order to understand the way in which the heart fulfils its duties, we must constantly bear in mind that the heart is a muscular organ, split up into four distinct chambers, and richly supplied with nerve power. The action of the heart is made up of two sets of motions, the dilatation and contraction alternately of the auricles and ventricles. The auricles contract together in alternation with the contraction of the ventricles, which is also simultaneous. The dilatations follow the same rule, and the contraction of the auricles takes place at the same moment that the ventricles are dilating, and *vice versâ*. The interval between the two sets of movements is, of course, very short, but is easily made out when the heart is acting quietly. During the contraction of the ventricles the apex of the heart is drawn upwards and tilted forwards, striking the walls of the chest, thus giving that sensation which is described as the beat of the heart, and which in a healthy state is usually felt between the fifth and sixth ribs. When the action of the heart is examined by the ear, two sounds are heard. The first is dull and prolonged; its commencement coincides with the impulse of the heart, and just precedes the pulse at the wrist; the second is a shorter, sharper sound, which follows the pulse. The two sounds of the heart may be likened to the words *lŭb, dŭp*. The cause of the first of these sounds is still very uncertain. It coincides in point of time with the contraction of the ventricles, and is probably partly caused by the noise or *bruit* produced by the contraction of muscular fibre. Possibly the first sound is also due to the closure of the *mitral* and *tricuspid* valves. The second sound is held to be occasioned by the sudden tightening of the *semi-lunar* valves when they are pressed across the orifices of the aorta and pulmonary artery. The contraction of the auricles is a much more rapid and less complete process than that of the ventricles. The auricles are probably never completely emptied; but the ventricles contract so firmly that in some cases where the heart has been examined after death their cavities have been found completely obliterated, only a slight fissure marking their existence. The heart, then, by its contraction propels the blood, and the amount of force thus generated is sufficient to carry the blood through the complete circle. This force calculated for twenty-four hours has been estimated to be equal to that expended in raising 124 tons one foot high. The left ventricle, as would be supposed, from the much greater thickness of its walls, contracts with a force nearly double that of the right.

The time required for the blood to traverse the circulatory system is very brief, the average probably being about a minute, though in some experiments made by injecting substances into the vein of an animal the circuit was completed in a much shorter time. The heart is regulated in its ordinary movements by nervous masses (the *cardiac ganglia*) embedded in its substance; while a special nerve (*vagus* or *pneumo-gastric*) inhibits or restrains its speed, and another (*sympathetic*) spurs or stimulates its movements.

When speaking of the structure of the arteries, it was said that they had three chief coats, one of which was elastic, another muscular, and the third mucous. The purpose of the first coat is to enable the vessel to expand when the blood is forced into it by the ventricle, and so save the artery from giving way under the sudden pressure to which it is subjected. This elastic property also serves another purpose, by reducing what without it would be an intermittent and jerking flow of the blood to a continuous stream. It is also of great importance in enabling the vessels to enlarge when from any cause a sudden increase in the supply of blood to any part of the body takes place. The muscular property of arteries, though it does not probably directly aid in propelling the blood, is important, as regulating the quantity of blood sent to any particular tissue, according to its requirements at any special moment; it is also essential when an artery is wounded, enabling the vessel to contract, closing the orifice, and so preventing bleeding. The jerking motion of the blood, which it is the purpose of the elastic properties of the arteries to control, but which is not entirely subdued until the blood reaches the capillaries, causes that pulsation which is felt at the wrist or at any other spot where the artery is sufficiently superficial, and which is commonly known as the *pulse*. The pulse is, of course, a measure of the frequency of the heart's action, as its beats correspond with the contraction of the ventricles; the pulse varies according to age, and is affected by many circumstances—the average in an adult is from 70 to 75 per minute; in an infant at birth, 140; whilst in old age it gradually declines from the adult standard; in persons of an excitable or sanguine temperament it is quicker than in the phlegmatic, and it is also more rapid in women than in men. After a meal the pulse is quicker than while fasting, and any exertion, not carried sufficiently far to produce exhaustion, increases its rapidity in proportion to the severity of the exercise taken. In the morning it is more rapid than at night, when the body is fatigued. Position also influences it; it is slowest in the recumbent posture; sitting or standing increases it, the latter more so, as requiring more muscular action.

When the blood reaches the capillary network, it begins to move at a much slower rate; and when it is examined by a microscope, as can be easily done in the web of a frog's foot, it is seen that the red corpuscles occupy the centre of the stream, and move most rapidly, whilst the white creep along the walls of the vessel at a very sluggish pace, and even sometimes seem to adhere to or to pass through them. The greater slowness of the circulation in the capillaries is caused partly by the much larger area in the aggregate of these vessels, and also as a consequence of this, the large increase of the friction caused by the walls of the vessels. The purpose of this retardation will be seen when we come to speak, as we shall do directly, of the process of nutrition. In the veins the blood moves as in the capillaries, without any jerking motion, but at a greater pace, though not so fast as in the arteries. Here the valves which are placed in most of the larger veins play an important part, in preventing a backward flow of the blood, and thus compensating in a measure for the diminished influence of the heart's action.

Such, then, is the circulation of the blood; and we must now shortly inquire how it fulfils its purpose of maintaining and nourishing the body. When the blood is circulating slowly through the capillaries it is brought into most intimate relations with the various tissues which it has to supply; whilst the walls of these vessels are of such a degree of fineness as to offer the least possible resistance to the process of absorption that is constantly going on through them. Each tissue has the power of appropriating that element which is suitable to itself from the common current, and letting the unsuitable elements pass on. This selective power of the tissues is not confined to the nutrient materials which are necessary for their building up and maintenance, but is found also to exist with regard to foreign substances introduced into the blood, whether accidentally as poisons or intentionally as curative agents. For instance, the presence of arsenic in the blood is followed by an irritation of the mucous membranes throughout the body, whilst lead is taken up in some way so that the extensor muscles of the fore-arm are affected, and that peculiar kind of paralysis known as *lead palsy* is produced. In the same way, certain organs or tissues have the power of appropriating medicinal substances introduced into the general circulation. This process of absorption, which is the first step of the more complex one of nutrition, may sometimes be observed: particles are seen to pass from the circulation into the tissues, and, in return, other particles pass back from the tissues into the circulation. But here we are simply upon the threshold of the subject; our knowledge extends no farther. We know not, save on the idea of the selective power of the living cells of the body, how from the same blood such a variety of textures are formed, nor the many modifications the crude elements of the blood must pass through before they are converted into bone, flesh, or skin.

Performing, as is supposed, some office in connection with the manufacture of the blood or its circulation, are two glandular bodies, the spleen and the thyroid body. These are known as *ductless glands*, as no duct has hitherto been discovered in connection with them. The spleen, which is a bluish-red-looking gland, of a pulpy consistence, in the adult weighs about seven ounces, but is sometimes enormously increased in size by disease, especially after intermittent fever, when it receives the common name of "ague cake." It is situated in the abdomen, on the left side, embracing the larger end of the stomach, and in contact with the tail of the pancreas. The thyroid body is a gland composed of three lobes, of a brownish-red colour, weighing from two to three ounces; it is situated in the lower part of the throat, resting upon the windpipe; when diseased, it becomes enormously enlarged, and constitutes the disease known as *goitre* or Derbyshire neck. As to the function of either of these bodies little is certainly known, though the subject has received the attention of many of the most eminent of physiologists. With regard to the spleen, it has been observed that towards the end of the digestive process it is considerably enlarged; and, consequently, it has been thought that in some way it influenced the albuminous elements of the food, elaborating them so as to fit them for reception into the blood. Another opinion is that the spleen is a destructive organ, that in it the worn-out corpuscles of the blood are disintegrated and broken up; while it is also now regarded as a blood gland in that it manufactures new corpuscles. Still less is known of the function of the thyroid body; but the purposes either of these organs serve are apparently not absolutely essential to life. The spleen has been removed entire from dogs, and in some cases from men, without any apparent ill results following; and the structure of the thyroid gland is also occasionally destroyed by disease, without any great disturbance of the health of the individual. The spleen and thyroid gland may, in fact, be regarded as parts of the lymphatic system.

The blood, in addition to supplying the nutritive material from which all the structures of the body are formed, acts as a vehicle to carry out to lungs, skin, and kidneys the waste matter from the worn-out tissues, the retention of which in the system would be prejudicial to the health, or even destructive of life

GERMAN.—VIII.

[Continued from p. 22.]

VARIOUS IDIOMS.

THE following prepositions must be committed to memory:—

Nach, to (motion to a place).
Zu, at *or* to (motion to a person).
Bei, at *or* near.
Mit, with.

The word Haus, without the article, when preceded by the preposition nach, answers to our "home" after verbs of motion, as:—Er geht nach Hauſe, he is going *home.*

Zu Hauſe answers to our "at home," as:—Er iſt zu Hauſe, he is *at home.*

Bei (at) is commonly used with verbs of rest, and signifies "at one's house," as:—Er wohnt bei uns, he lives at our house; Ich kaufte es bei meinem Vetter, I bought it at my cousin's.

Mit is used precisely like the English preposition *with*, as:—Ich gehe mit ihm, I am going with him.

Zu Jemanden gehen signifies, frequently, to go to the house or residence of someone, as:—Ich gehe zu meinem Oheim, I am going to my uncle's; Wollen Sie heute Abend zu uns kommen? will you come to our house this evening?

In German different prepositions are followed by nouns in different cases. For instance, while the prepositions bei, nach, mit, von, zu, etc., govern no case but the dative, an, auf, in, unter, etc., govern the dative only when used with a verb of rest, or of motion within specified limits, as:—

Der Mann arbeitet an dem (am) Tiſche.	The man is working at the table.
Das Kind tanzt auf dem Brette.	The child is dancing on the board.

Der Knabe ſpielt in dem Garten.	The boy is playing in the garden.
Der Hund iſt unter dem Baume.	The dog is under the tree.

But when motion towards a given point is signified, the accusative is used with an, auf, in, unter, as :—

Der Mann geht an den Tiſch.	The man is going to the table.
Das Kind ſpringt auf das (aufs) Brett.	The child springs upon the board.
Der Knabe eilt in den Garten.	The boy hurries into the garden.
Der Hund läuft unter den Baum.	The dog runs under the tree.

Dative and Accusative.

Der Fiſch ſchwimmt in dem Waſſer.	The fish swims *in* the water.
Der Stein fällt in das Waſſer.	The stone falls *into* the water.
Er ſteht an der Thüre.	He is standing *at* the door.
Er geht an die Thüre.	He is going *to* the door.

DECLENSION OF Derſelbe.

Derſelbe (the same) is compounded of der and ſelber. It is inflected precisely like derjenige, *i.e.*, like an adjective with the definite article.

	Sing.			*Plur.*
	Masc.	*Fem.*	*Neut.*	*All genders.*
N.	Derſelbe,	dieſelbe,	dasſelbe,	dieſelben, the same.
G.	Desſelben,	derſelben,	desſelben,	derſelben, of the same.
D.	Demſelben,	derſelben,	demſelben,	denſelben, to the same.
A.	Denſelben,	dieſelbe,	dasſelbe,	dieſelben, the same.

Derſelbe is often used in place of a personal pronoun, to avoid repetition or ambiguity, as :—Haben Sie dieſelbe (ſie) geſehen? have you seen (the same) her? Der Mann lobt den Knaben, weil derſelbe ſeine Mutter ehrt, the man praises the boy, because the same (he) honours his mother; Er liebt ſeinen Bruder, aber nicht die Kinder desſelben, he loves his brother, but not his children (he loves his brother, but not the children of the same).

The genitive of the substantive pronoun der is also thus used, as :—Er liebt ſeinen Bruder, aber deſſen Kinder nicht, he loves his brother, but not (that one's) his children.

EXAMPLES.

Wo iſt der Fremde, der vor'geſtern bei uns war?	Where is the stranger who was at our house the day before yesterday?
Er iſt geſtern nach Wien gereiſt'.	He went yesterday to Vienna.
Iſt dieſes Buch dasſel'be, welches Sie geſtern Abend gele'ſen haben?	Is this book the same that you read last evening?
Ich liebe dieſen Schüler, weil er ſo fleißig iſt.	I love this scholar, because he is so diligent.
Meine Freundin aus Ame'rika war geſtern hier; haben Sie dieſel'be ſchon geſe'hen?	My friend from America was here yesterday; have you seen her yet?
Ich habe des Lehrers Buch, aber nicht das Meſſer desſel'ben.	I have the teacher's book, but not his knife.

VOCABULARY.

Blei, *n.* lead.
Brauchen, to require, to need.
Eltern, parents.
Krieg, *m.* war.
Laden, *m.* shop, store.
Lahm, lame.
Ring, *m.* ring.
Schicken, to send.
So, so, as.
Taſch'enuhr, *f.* watch.
Truppen, troop.
Un'dankbar, unthankful.
Weil, because.

EXERCISE 33.

Translate into English :—

1. Wo iſt das Blei, welches Sie gekauft haben? 2. Es iſt noch im Laden, wo ich es gekauft habe. 3. Haben Sie dieſelbe Feder, welche ich gehabt habe? 4. Wem werden Sie dieſe goldene Taſchenuhr ſchicken? 5. Ich werde ſie demſelben Manne ſchicken, welcher ſie mir geſchickt hat. 6. Wie viel Geld braucht dieſer alte Soldat? 7. Er braucht viel, weil er immer krank iſt. 8. Iſt es derſelbe, welcher geſtern hier war? 9. Nein, jener iſt heute ſehr lahm. 10. Wem ſchicken Sie den ſchönen Ring? 11. Ich ſchicke ihn dem Manne, welchen Sie ſo ſehr gelobt haben. 12. Haben Sie die Freunde meines Bruders gelobt? 13. Ja, ich habe ſie gelobt. 14. Haben Sie dieſelben nicht geliebt? 15. Ich habe eine kleine Schweſter, welche ich liebe; lieben Sie dieſelbe? 16. Der Oheim liebt ſeinen Neffen, aber derſelbe iſt undankbar. 17. Der Vater liebt ſeinen kleinen Sohn, weil derſelbe gut iſt. 18. Warum ſind ſo viele Truppen in der Stadt? 19. Weil ſie aus dem Kriege gekommen ſind. 20. Warum lieben uns unſere Eltern? 21. Weil wir ihre Kinder ſind. 22. Zu wem gehen Sie? 23. Ich gehe zu meinem Vetter. 24. Mit wem gehen Sie? 25. Ich gehe mit meinem Bruder.

EXERCISE 34.

Translate into German :—

1. Is your brother at home? 2. Yes, but he is ill. 3. Where have you bought this watch? 4. I bought it of the watchmaker. 5. These rings are beautiful, will you give me one of them? 6. The troops which went to Leipsic returned yesterday. 7. The teacher loves the boy, because he writes beautifully. 8. Do you go to your parents? 9. I go with my brother. 10. These children love their teacher, because he is good to them. 11. Do you require my books any longer? 12. I will give you them back to-morrow.

CONJUGATION OF THE AUXILIARY VERBS OF MOOD.

THE auxiliary verbs of mood in German are dürfen, können, mögen, müſſen, ſollen, and wollen. There are certain irregularities in their conjugation, and as they are constantly in use it is of the utmost importance to master them thoroughly.

1. Durfen expresses a possibility dependent upon the will of another, or upon a law, as:—Ich darf dieſe Blumen nicht pflücken, I cannot (I am not allowed, permitted to) pluck these flowers; Der Bauer darf nicht fiſchen, the peasant is not allowed (by law) to fish; Ich darf dieſe Früchte eſſen, aber ich kann ſie nicht erreichen, I can (have the right to) eat these fruits, but I cannot obtain (get at) them.

CONJUGATION OF THE PRESENT AND IMPERFECT OF Durfen.

PRESENT.

Sing.	*Plur.*
Ich darf, I am permitted.	Wir dürfen, we are permitted.
Du darfſt, thou art permitted.	Ihr durfet, you are permitted.
Er darf, he is permitted.	Sie durfen, they are permitted.

IMPERFECT.

Ich durfte, I was permitted.	Wir durften, we were permitted.
Du durfteſt, thou wast permitted.	Ihr durftet, you were permitted.
Er durfte, he was permitted.	Sie durften, they were permitted.

2. Konnen corresponds in the present and imperfect to the English "can," as:—Der Fiſch kann ſchwimmen, the fish can swim; Er konnte nicht leſen, he could not read.

Konnen also answers sometimes to "may," as:—Das kann ſein, that may be; Er kann ſchon da ſein, he may be already there; Es kann regnen, it may rain.

CONJUGATION OF THE PRESENT AND IMPERFECT OF Können.

PRESENT.

Sing.	*Plur.*
Ich kann, I can.	Wir können, we can.
Du kannſt, thou canst.	Ihr könnt, you can.
Er kann, he can.	Sie können, they can.

IMPERFECT.

Ich konnte, I could.	Wir konnten, we could.
Du konnteſt, thou couldst.	Ihr konntet, you could.
Er konnte, he could.	Sie konnten, they could.

3. Mögen expresses a possibility dependent on the will of the subject or the speaker, as:—Er mag gehen, he can (may, is at liberty to) go; Sie mögen gehen, you may (have permission to) go; Ich mag ihn nicht ſehen, I do not wish to see him; Das mag ich nicht glauben, I do not like to believe that.

Mögen, like "may," denotes a concession on the part of the speaker, as:—Er mag ein treuer Freund ſein, he may be a true friend; Sie mögen es gethan haben, they may have done it.

CONJUGATION OF THE PRESENT AND IMPERFECT OF Mögen.

PRESENT

Sing.	*Plur.*
Ich mag, I may *or* am allowed.	Wir mögen, we may *or* are allowed.
Du magſt, thou mayst *or* art allowed.	Ihr möget, you may *or* are allowed.
Er mag, he may *or* is allowed.	Sie mögen, they may *or* are allowed.

IMPERFECT

Ich mochte, I was allowed.	Wir mochten, we were allowed.
Du mochteſt, thou wast allowed.	Ihr mochtet, you were allowed.
Er mochte, he was allowed.	Sie mochten, they were allowed.

4. Muſſen, in those tenses in which its English equivalent "must" is defective, is to be rendered by "to be obliged, forced, compelled," etc., as Er mußte es thun, he was obliged to do it.

CONJUGATION OF THE PRESENT AND IMPERFECT OF Müſſen.

PRESENT.

Sing.	*Plur.*
Ich muß, I must.	Wir müſſen, we must
Du mußt, thou must.	Ihr müßt, you must.
Er muß, he must.	Sie müſſen, they must.

IMPERFECT.

Ich mußte, I was obliged.	Wir mußten, we were obliged.
Du mußteſt, thou wast obliged.	Ihr mußtet, you were obliged.
Er mußte, he was obliged.	Sie mußten, they were obliged.

5. Sollen indicates necessity dependent upon the will of another person, thus corresponding in signification with the second and third persons of our word "shall," as:—Du ſollſt ſterben, thou shalt die; Er ſoll es thun, he shall do it; Sie ſollten hier bleiben, you should (ought to) remain here; Wenn er kommen ſollte, if he should come.

CONJUGATION OF THE PRESENT AND IMPERFECT OF Sollen.

PRESENT.

Sing.	*Plur.*
Ich ſoll, I shall.	Wir ſollen, we shall.
Du ſollſt, thou shalt.	Ihr ſollet, you shall.
Er ſoll he shall.	Sie ſollen, they shall.

IMPERFECT.

Ich ſollte, I should.	Wir ſollten, we should.
Du ſollteſt, thou shouldst.	Ihr ſolltet, you should.
Er ſollte, he should.	Sie ſollten, they should.

6. **Wollen** expresses a desire, but not a positive intention, and is rendered by "to wish," as:—Was will er? what does he wish? Was will er thun? what does he wish to do?

The imperfect often answers to our "was going," when expressive of purpose, as:—Ich wollte ſagen, I was going to say.

CONJUGATION OF THE PRESENT AND IMPERFECT OF Wollen WITH AN ACTIVE VERB.

PRESENT.

Sing.	*Plur.*
Ich will gehen, I wish to go.	Wir wollen gehen, we wish to go.
Du willſt gehen, thou wishest to go.	Ihr wollet gehen, you wish to go.
Er will gehen, he wishes to go.	Sie wollen gehen, they wish to go.

IMPERFECT.

Ich wollte gehen, I wished to go.	Wir wollten gehen, we wished to go.
Du wollteſt gehen, thou wishedst to go.	Ihr wolltet gehen, you wished to go.
Er wollte gehen, he wished to go.	Sie wollten gehen, they wished to go.

The perfect and pluperfect tenses of these verbs, as also of laſſen, to permit, to cause, is formed by means of the infinitive, instead of the participle, as:—

Er hat nicht gehen können.	He has not been able to go.
Wir haben nie ſchießen dürfen.	We have never been allowed to shoot.
Ich habe es nicht thun mögen.	I have not wished to do it.
Sie haben ſchreiben müſſen.	They have been obliged to write.
Sie hätte leſen ſollen	She ought to have read.
Sie haben nicht arbeiten wollen.	You have not been willing to work.
Ihr habt ihn nicht gehen laſſen	You have not caused him to go (have not sent him).

The future of these verbs is formed in the regular way, as:—

Ich werde reden dürfen.	I shall be allowed to speak.
Du wirſt ihn ſehen können.	You will be able to see him.
Er wird bleiben mögen.	He will wish to remain.

HOW THE TIME IS EXPRESSED IN GERMAN.

"What o'clock is it?" is represented in German by Wie viel Uhr iſt es? This phrase, like the corresponding one in English, is abbreviated, the full form being Wie viel auf der Uhr iſt es? what o'clock (literally, *how much upon* the clock) is it?

When a part or the whole of the last quarter of an hour is named, it is designated, as in English, by its distance from the hour *following*, as:—

Es fehlen fünf, acht, oder zehn Minuten bis (*or* an) zwölf	It lacks five, eight, *or* ten minutes to twelve.
Es fehlt ein Viertel bis zwölf.	It lacks a quarter to twelve.

When a half-hour is named, it is not measured, as in English, from the preceding hour, but from the one that follows. This is, likewise, commonly the case with any part or the whole of the first quarter, although it may, as in English, be referred to the hour preceding, as:—

Es iſt halb* zwölf.	It is half (towards twelve) past eleven.
Es iſt zehn Minuten auf zwölf.	It is ten minutes (towards twelve) past eleven.
Es iſt ein Viertel auf zwölf.	It is a quarter (towards twelve) past eleven.
Es iſt zehn Minuten nach eins.	It is ten minutes past one.
Es iſt ein Viertel nach eins.	It is a quarter past one.

KEY TO EXERCISES.

Ex. 27.—1 Has the captain his own or the general's sword? 2. He has his own. 3. Have you my scissors? 4. No, I have my own. 5. Who has my stick? 6. Mr. S. has it. 7. Has my sister your umbrella? 8. No, she has her own. 9. Has the locksmith my key? 10. No, he has it not. 11. Has the washerwoman my brother's and my friends' shirts? 12. She has his as well as theirs. 13. All people have their errors and peculiarities—I have mine, you have yours, and he has his. 14. God is Almighty; man's destinies are in His hands, also mine and thine. 15 The ocean is between me and mine. 16. Has Mr. A. your paper or mine? 17. He has his own. 18. My brother has my book, and I have his. 19. Has he your wafers and stamps, or his own? 20. He has mine. 21. Whose waggon has your good friend Mr. G.? 22. He has that of his uncle. 23. And whose horses has he? 24. He has his own? 25. Whose gloves have you? 26. I have my own. 27. Whose sheep are these in the meadow? 28. They are ours. 29. Have these Germans their horses and their waggons, or ours? 30. They have ours. 31. Whose books have these scholars? 32. They have their own. 33. Do you always take your property? 34. Yes, everybody takes his own. 35. When did you see your family? 36. I saw them the day before yesterday. 37. Did you see me and my family yesterday evening at the concert? 38. Yes, I saw you and your family. 39. The commander praised his soldiers.

Ex. 28.—1. Der Kutſcher des Grafen B. hat ſeine Pferde. 2. Die Tochter des kranken Generals ſind ſehr ſtolz. 3. Ich habe meinen Briefſtempel verloren, aber hier iſt der Ihrige und der ſeinige. 4. Wem gehören dieſe ſchönen Wieſen? Sind ſie die Ihrigen? 5. Nein, ſie ſind nicht die meinigen; ſie ſind das Eigenthum meines Freundes, Herr K. 6. Haben Sie ſeinen Schlüſſel, oder den Ihrigen? 7. Ich habe weder den ſeinigen, noch den meinigen, ſondern denjenigen meiner Frau. 8. Sie entdeckten den Dieb an dem Hemde welches er trug, und welches nicht das ſeinige war. 9. Wann ſahen Sie Ihre Freunde? 10. Ich habe ſie ſeit jüngſtem Sommer nicht geſehen. 11. Er liebt zu ſehr das Seinige. 12. Haben Sie mich und die Meinigen, geſtern Abend zwiſchen ſieben und acht Uhr in der Allee geſehen?

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*In the case of halb, the preposition auf is commonly omitted, but the full phrase is Halb auf zwölf.

Ex. 29.—1. Which child does the uncle love? 2. He loves that which he praises. 3. Which child loves the uncle? 4. The one that he loves, loves him. 5. Which hat have you? 6. I have that which your brother had yesterday. 7. Which boy does the father love? 8. He loves the one that the mother praises. 9. Which boy loves the mother? 10. The one that the father praises. 11. Which horse has your brother bought? 12. He has bought that which you had yesterday. 13. Which man do you praise? 14 I praise that man whose son you love. 15. Which books have you bought? 16. I have bought those which my brother has had in school. 17. Whose books have you? 18. I have the books of those boys whom you saw to-day. 19. Those who are vicious have no tranquillity of soul. 20. The one who has the scar on the forehead is the old magistrate. 21. That is good which is useful. 22. These men are the same whose barns, stables, and dwellings you saw yesterday. 23. The hermit of yonder chapel is a friend of those who are helpless and forsaken. 24. He is wise who is virtuous.

Ex. 30.—1. Der Freund, welchen ich habe, iſt treu. 2. Weſſen Schlüſſel haben Sie? 3. Ich habe den meines Bruders welcher Sie kennen. 4. Ich werde dieſes Buch demjenigen geben, welcher zuerſt hier ſein wird. 5. Haben Sie mein Buch geſehen? 6. Nein, ich habe nicht dasjenige geſehen, welches Sie erwähnen. 7. Die Freude, die ich haben werde wird groß ſein. 8 Ich kam, weil ich es ihm verſprochen hatte. 9. Wo wohnen Sie? 10. Ich wohne in demſelben Hauſe, in welchem ich wohnte, als Sie mich beſuchten. 11. Welche dieſer Damen iſt Ihre Frau? 12. Diejenige, welche mit dem alten Herrn ſpricht. 13. Der Freund, welchen ich verloren habe, war mir ſehr theuer. 14. Ich habe den Rock gekauft, welchen Sie in dem Fenſter meines Schneiders ſahen. 15. Empfehlen Sie mich dem Herrn, welcher ſo ſehr höflich iſt.

Ex. 31.—1. Is this young man ill? 2. No, but he was ill yesterday. 3. Who has been in your father's garden? 4. Nobody has been in the garden, but somebody has been in his house. 5. How long does the old peasant still remain in the town? 6. I am not acquainted with the old peasant, and don't know how long he remains. 7. Is your old friend, the merchant, gone to Vienna? 8. I believe he is gone to Berlin to his brother. 9. From whom have you heard this news to-day? 10. I have spoken to one of my friends, who has come from Dresden, and has brought a letter to me from my father. 11. I reside with my uncle, and go with him to the little village. 12. My beautiful bird has flown out of the cage, and my little horse has run to the forest. 13. What has your father written to you? 14. He has written (to) me a long letter. 15. When were you at the market? 16. I was there the day before yesterday in the evening, and bought some beef. 17. We have had beautiful weather this afternoon. 18. These scholars have been lazy, and those diligent. 19. The snow was very deep the day before yesterday. 20. I have never been ill. 21. Frederick the Great was (a) King of Prussia.

Ex. 32.—1. Iſt Ihre Schweſter, welche mir dieſe Blumen gab, zu Hauſe? 2. Nein, ſie iſt auf das Land gegangen. 3. Es iſt Jemand in dem Garten geweſen. 4. Wohnen Sie in Berlin? 5. Nein, ich wohne in Dresden. 6. Die Königin iſt von Belgien zurück gekommen. 7. Kennen Sie den Kaufmann, welcher von Wien kam? 8. Ja, ich kenne ihn. 9. Sie haben wenig Vergnügen auf Ihrer Reiſe gehabt; Sie ſind nicht weit geweſen. 10. Sie hatten mehr Vergnügen, als wir hatten, aber wir ſind ebenſo vergnügt geweſen als Sie.

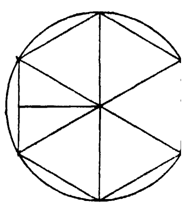
GEOMETRY.—VIII.

[*Continued from p. 27.*]

POLYGONS.

FIGURES contained by more than four straight lines occur less often, and usually only in their simplest and perfectly regular forms. They are known collectively as multilateral (*i.e.*, many-sided) figures, or *polygons* (*i.e.*, figures of many angles).

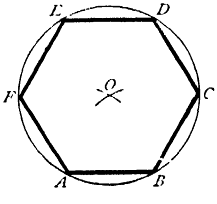
A polygon containing five angles (or sides) is called a *pentagon;* if it contains six angles (or sides) it is called a *hexagon;* if seven angles (or sides) a *heptagon;* if eight, an *octagon;* if nine, a *nonagon;* if ten, a *decagon;* if eleven, an *undecagon;* if twelve, a *dodecagon* or *duodecagon.* Euclid mentions the *quindecagon,* or fifteen-sided figure.



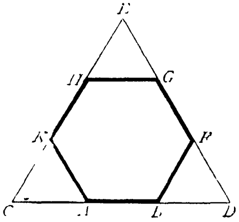
Polygons, like quadrilaterals, may be regarded as being made up of triangles. Regular polygons may be regarded as being made up of the same isosceles triangle repeated. Thus, the hexagon may be regarded as being formed by the repetition of the equilateral triangle. Three such angles as those of an equilateral triangle are together equal to two right angles, and six to four right angles. It follows that six such triangles placed point to point around the same centre exactly cover the angular space surrounding the centre, and that the six bases form the continuous outline of a figure of six sides.

The sum of all the sides of a polygon, *i.e.*, the total length of the boundary of the figure, is called its *perimeter* (measure around or about). The perpendicular from the centre of a regular polygon to the middle point of a side is called the *apothem.*

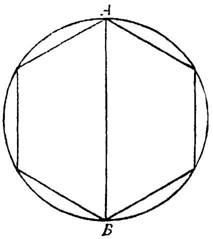
Of polygons having not more than twelve sides, the hexagon, the octagon, and the dodecagon are described by exact and simple processes; the pentagon and the decagon by a process which is exact, but less simple; the heptagon, the nonagon, and the undecagon are only to be described by methods which are of an approximative nature.



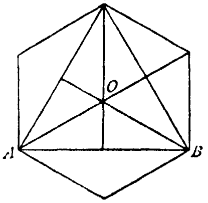
Problem 89.—*On a given straight line to construct a regular hexagon.* Let A B be the given straight line. About the centres A and B, with radius A B, describe arcs of circles intersecting in O. About the centre O with the same radius describe a circle passing through A and B. With the same radius cut off the equal arcs B C, C D, D E, E F, and F A. Lines joining each point on the circumference to the next form the regular hexagon on A B.



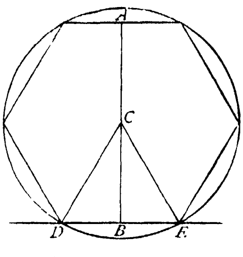
Second method.—Produce A B both ways, making A C on the one side and B D on the other each equal to A B. On C D describe an equilateral triangle E C D. Divide the sides C E and D E each into three equal parts at the points K and H and F and G respectively, as C D is divided at A and B. Join B F, G H, and K A, completing the figure A B F G H K, which is the hexagon required.



Problem 90.—*On a given straight line as the central line from one of the angles* (i.e., *on a longer diagonal*) *to describe a regular hexagon.* Let A B be the given straight line. On A B as diameter describe a circle, and with the same radius cut the circumference into six equal parts. The six points of section are the six angular points of the regular hexagon required.

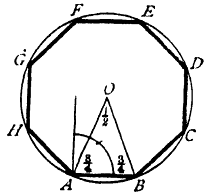


Problem 91.—*On a given straight line as shorter diagonal to describe a regular hexagon.* Let A B be the given straight line. On A B describe the equilateral triangle C A B. Bisect each of its three angles and draw the bisectors, which will all three pass through its centre O. Draw parallels from each of the points A, B, and C to the bisectors of the other two angles, forming the regular hexagon required.

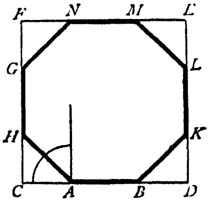


Problem 92.—*On a given straight line as diameter to describe a regular hexagon.* Let A B be the given straight line. Through B draw a straight line at right angles to A B. Bisect A B in C, and with B C as altitude describe an equilateral triangle C D E. About C as centre, with radius C D or C E, describe a circle passing through D and E, and with the same radius divide the circumference into six equal parts, the chords of which, as before, form the regular hexagon required.

Problem 93.—*Upon a given straight line to describe a regular octagon.* Let A B be the given straight line. At the points A and B in the straight line A B make angles each equal to three-fourths of a right angle. This may be done by bisecting the upper half of the arc of any quadrant contained between the given line and a perpendicular to it. Let O be the point in which the other sides of these angles intersect. About O as centre, with the radius O A or O B, describe a circle, and with the distance A B cut its circumference into eight equal parts at the points A, B, C, D, E, F, G, and H. Join each point to the next following, commencing with B, and the polygon A B C D E F G H is the regular octagon required.

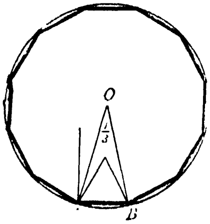


The angle at the central point O is one-eighth part of the total angular magnitude of four right angles round O, and therefore eight such triangles as O A B can be placed in succession round that point to form the regular octagon required.



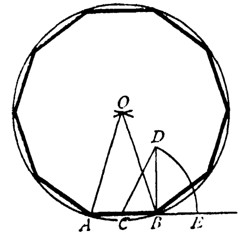
Second method.—Produce A B both ways, and at the points A and B make angles with the produced parts each equal to half a right angle. This may be done by drawing a perpendicular at A and bisecting the arc of any quadrant between this perpendicular and the produced portion of A B. From the other sides of these angles cut off A H and B K, each equal to A B. Through the points H and K draw straight lines at right angles to A B produced, meeting it in C and D, and complete the square C D E F. Divide each of the three remaining sides of the square as C D, the first side, is divided in A and B. Join L M and N G, completing the regular octagon required.

Problem 94.—*On a given straight line to describe a regular dodecagon.* Let A B be the given straight line. At the points A and B make angles each equal to five-sixths of a right angle. This may be done by bisecting the angles between the sides of an equilateral triangle described on A B and the perpendiculars at A and B. Let O be the point in which the other sides of these angles intersect. About O as centre, with the radius O A or O B, describe a circle, and with the distance A B cut its circumference into twelve equal parts; which can be done, as the angle A O B is one-third of a right angle—*i.e.*, one-twelfth of the total angular magnitude of four right angles round O. The required dodecagon may then be completed by drawing straight lines from each point in the circumference to the next.



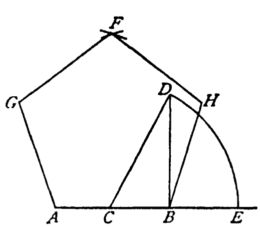
The next three problems depend upon the subdivision of a right angle or, more strictly speaking, of two right angles, in such a way as to obtain the exact one-fifth part. This object is accomplished by forming an isosceles triangle in which each of the equal angles at the base is double the angle at the vertex, a construction which has already been examined with the fulness due to its mathematical value in treating of the group of problems involving proportion.

Problem 95.—*On a given straight line to describe a regular decagon.* Let A B be the given straight line. Bisect A B in C, and at the point B in A B erect a perpendicular B D equal in length to A B, and join C D. About C as centre, with radius C D, describe an arc of a circle intersecting A B produced in E. About A and B as centres, with the radius A E, describe arcs of circles intersecting in O. About O as centre with the same radius describe a circle passing through A and B. The circumference of this circle may be divided into ten arcs each equal to the arc A B. The chords of these ten arcs form the regular decagon required.

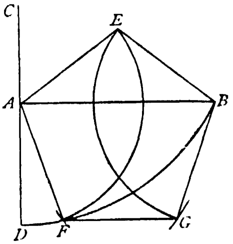


The triangle O A B has each angle at its base double the vertical angle. The vertical angle is therefore $\frac{1}{5}$th of two right angles or $\frac{1}{10}$th of four right angles, and consequently ten such triangles as O A B placed in succession round the point O fill up the angular space round O, and form a regular decagon.

Problem 96.—*On a given straight line to describe a regular pentagon.* Let A B be the given straight line. Form the triangle F A B in the same way that the triangle O A B was formed in the previous problem. With A, B, and F as centres, and the radius A B, describe arcs of circles intersecting two and two in G and H. Join A G, G F, F H, and H B, completing the regular pentagon required. The triangle F A B has each of the angles at the base double the vertical angle.

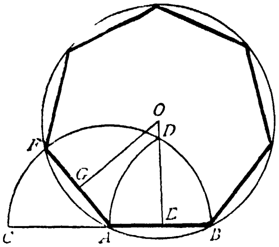


Problem 97.—*On a given straight line as diagonal to describe a regular pentagon.* Let A B be the given straight line. At the point A in A B erect a perpendicular A C, equal in length to the half of A B. About C as centre, with the radius C B, describe an arc of a circle meeting C A produced in D. About A and B as centres, with radius A D, describe arcs of circles which meet at a point E, and, after crossing each other at a second point, are terminated at F and G by arcs of circles, described respectively from B and A as centres, with the radius A B. Straight lines joining the points A, E, B, G, and F, each one to the next, form the regular pentagon required.



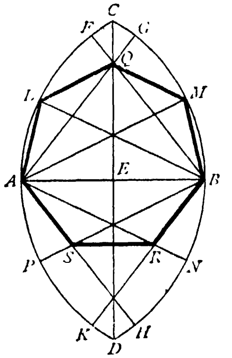
This and the two previous solutions depend on the fact that, if an isosceles triangle be formed, having its sides in the proportion of 2, 2, and $\sqrt{5}-1$ (such as E F G in the present figure would be if E F and E G were joined), the vertical angle is half each of the others, and one-fifth of two right angles, or one-tenth of four right angles.

Problem 98.—*On a given straight line to describe a regular heptagon.* Let A B be the given straight line. Produce B A, and about the point A as centre, and with A B as radius, describe a semicircle meeting B A produced in C. With the point B as centre, and with the same radius, describe an arc of a circle meeting the semicircle in D. Bisect A B in E, and draw the straight line from E through D. From C, with the distance D E, cut the semicircle in F. Join A F, which gives a second side of the polygon. Bisect A F in G, and draw the perpendicular meeting E D produced (*i.e.*, the perpendicular to A B) in O. About O as centre, with radius O A, O B, or O F, describe a circle. The circumference of the circle may then be divided into seven arcs by means of the distance A B or A F, and the chords of these arcs will form the required heptagon.



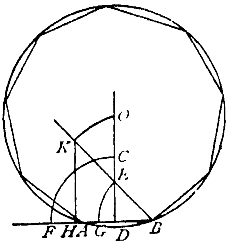
The essential part of this solution is the formation of an isosceles triangle, whose sides are in length as 2, 2, and $\sqrt{3}$. If C F were joined, the triangle A C F would be such a triangle. The vertical angle of a triangle, having sides of the length mentioned, differs from one-seventh of four right angles by just about one-five-hundredth part of the true magnitude. As such a triangle is readily described, it supplies a convenient means for an approximative construction of the heptagon, which cannot be produced by the help of straight-edge and compasses alone by any rigorously exact process.

PROBLEM 99.—*On a given straight line as one of the longer diagonals to describe a regular heptagon.* Let A B be the given straight line. About the centres A and B, with radius A B, describe arcs of circles intersecting in C and D. Join C D, cutting A B in E. About A and B as centres, with radius E C or E D, cut these arcs in F, G, H, and K. Bisect the arc A F in L, B G in M, B H in N, and A K in P. Join A G and B F intersecting in Q, A N and B K intersecting in R, and B P and A H in S. Then straight lines joining the points Q, M, B, R, S, A, L, and Q are the sides of the regular heptagon required.



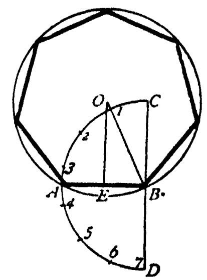
The solution of the problem may also be effected by taking any heptagon whatever, dividing it into triangles, and then, by Problem 68, drawing a similar figure, having a longer diagonal of the given length.

PROBLEM 100.—*On a given straight line to describe a regular nonagon.* Let A B be the given straight line. About A and B as centres, with the radius A B, describe arcs of circles intersecting in C. From D, the middle point of A B, draw a straight line through C. From D, along D C, cut off D E, equal to D A or D B, and draw a straight line from B through E. About D and B as centres, with the radii D C and B E respectively, describe arcs of circles meeting B A produced in F and B A in G. From H, the middle point of F G, draw the straight line H K parallel to D O, and meeting B E produced in K. About B as centre, with radius B K, describe an arc of a circle intersecting D C produced in O, and about O, with the same radius, describe a circle passing through A and B. With the length A B the circumference of this circle may be cut into nine arcs, the chords of which form the regular nonagon required. Its sides may be made thicker to give it due prominence.



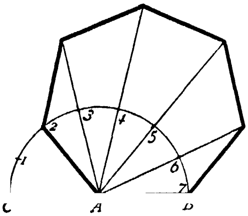
This solution gives a fairly close approximation to the true figure, the last of the nine sides being only about one-fortieth part too long. It depends on the fact that, when the radius of the circle is unity, the side of the nonagon is almost ($\sqrt{1}+\sqrt{2}-\sqrt{3}$).

PROBLEM 101.—*On a given straight line to describe a regular polygon of any number of sides.* Let A B be the given straight line, and, by way of example, let a regular heptagon be constructed. Through the point B draw a straight line, C B D, at right angles to A B. On this line describe a semicircle, having its centre at B, and for radius the distance B A. By trial divide the arc of the semicircle into seven equal parts. Draw a straight line from B through the first point of section, and let O be the point in which it meets the perpendicular to A B from E, the middle point of A B. About the centre O describe the circle passing through A and B, and it will be found that its circumference may be cut into exactly seven equal parts by adjusting the compasses to the distance A B. The straight lines joining each point on the circumference to the next form the required heptagon.



The angle subtended at the centre of the circle by the side of the polygon, viz., the angle A O B, is double the angle E O B, and therefore double the alternate O B C, *i.e.*, double one-seventh of two right angles. Hence the angle A O B is one-seventh of four right angles, and seven such angles as A O B, placed in succession, fit into the total angular space around the central point O.

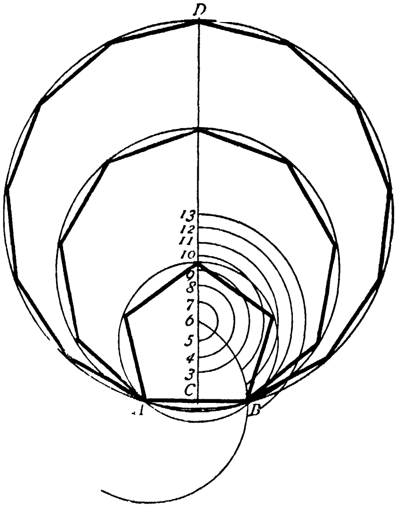
Second method.—Produce B A, and let the produced part, A C, be made equal to A B. On C B describe a semicircle, and by trial divide its circumference into seven equal parts. From A draw a straight line through every point on the arc of the semicircle, except the first. Between these lines place in succession (as in the figure) straight lines, each equal to A B or A 2, and the required heptagon is again produced.



It will be seen that the heptagon is formed of five triangles, *i.e.*, that there is a triangle for every side, except A 2 and A B. These five triangles contain fifteen angles and a total angular magnitude of twice five, or ten right angles, an equal seventh of which is due to the angle B A 2 of the polygon. One-seventh of ten right angles is five-sevenths of two right angles, the magnitude given to this angle in the construction.

The two methods now given of solving the general problem are both suited for the construction of a polygon, whatever be the number of its sides, but neither is good geometry, so far as we effect the subdivision of the semicircle by trial instead of by some geometrical process leading directly to the required result.

Problem 102.—*On a given straight line to describe a regular polygon.* Let A B be the given straight line. Bisect A B in C, and let the perpendicular at C be C D. About A as centre, with the radius A B, describe an arc of a circle meeting this perpendicular in 6, and passing from 6 through B onwards. Divide the arc between 6 and B into six equal parts, continuing this subdivision beyond the point B if desired. About 6 as centre, with the radii represented by the chord of one such part, of two such parts, three such parts, and so on, describe arcs of circles, transferring the lengths of such chords to the perpendicular C D, above or below the point 6, as indicated in the figure by the numbers 3 to 13. Each of these numbers indicates the centre of the circle whose circumference passing through points A and B contains the polygon required. Thus, point numbered 5 is the centre of the circle containing the regular pentagon on the given line A B; point numbered 9 the centre of the circle containing the regular nonagon on A B; and point numbered 13 the centre of the circle containing the regular polygon of thirteen sides.



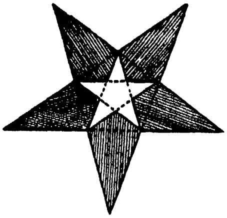
We have given this problem, but we ought to caution the student not to use it for figures of less than five sides or more than thirteen. The construction is theoretically true for the hexagon and the dodecagon, which, however, can be described accurately by very much simpler processes; it gives practically true results for the pentagon and the heptagon, fairly approximate results for the octagon, the nonagon, the decagon, and the undecagon; while for the regular polygon of thirteen sides the error in the last side is within one-tenth part of the true length.

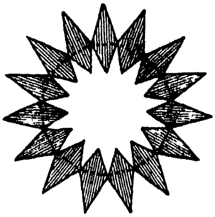
It will have been observed that the angular points of regular polygons are equidistant from the central point of the figure. It will also have been observed that as the number of sides increase, the shape of the polygon approaches more and more nearly to that of the circle. It will now be understood why the circle is sometimes spoken of as a polygon of an infinite number of sides, and how some of its properties may be examined by so considering it.

The star polygon may be formed from a regular polygon by joining each angular point to the next but one, always counting the points in the same direction.

In the case of a regular polygon with seven or more sides a star polygon may also be formed by joining each angular point to the next but two.

From all regular polygons a star polygon may also be formed by producing alternate sides. The left hand figure exhibits two pentagonal stars,





one interior and the other exterior, to the regular pentagon, which is taken as the guide to their formation.

The next star, or rather two stars, are formed from the quindecagon—the interior one by joining each point of the quindecagon to the sixth point beyond, always counting round the figure in the same direction. The exterior star is formed by drawing straight lines through each point of the quindecagon and the fifth point beyond.

MUSIC.—VIII.

[*Continued from p.* 31.]

RHYTHM (*continued*).

Pulse division—Quarter-pulses.

Many rhythmic effects are made by dividing pulses into ***quarters***, and by combining quarters with *halves*. The time name for a pulse divided into quarters is

tafatefe

Care must be taken by the learner to give the word its proper pronunciation, otherwise the use of it will not only not assist, but will positively hinder the conception of the proper rhythmic effect. When the four syllables are uttered in quick succession they should be pronounced as though they were spelt

taffateffe, not as tah-fah-tee-fee,

that is, the vowels should be "short." Then the whole word of four syllables must be performed in the same time as TAA (whole-pulse) or TAATAI (half-pulses). The pupil should practise from the following table, singing on a monotone, until he can go from one word to another with facility.

TAA
TAATAI
tafatefe.

Many useful exercises can be made in this way by repeating words and varying their order. Say as follows:—

TAA TAATAI tafatefe TAA
tafatefe TAA TAATAI TAA
TAA tafatefe TAATAI TAA
tafatefe tafatefe TAATAI TAA
etc. etc.

The names should not be spoken with rising and falling inflections, but should be monotoned on any convenient pitch, and a regular pulse should be maintained.

In doing this the pupil will not only be learning a *name*, but will be assimilating a *thing*, and he will easily master the exercises in notation that follow.

Whole pulse
: 1 ||
TAA

½ ½
: 1 . 1 ||
TAA - TAI

¼ ¼ ¼ ¼
:1,1.1,1||
ta-ta te-fe

(Tonic Sol-fa Notation.)

Quarter-pulses.

The division of a pulse into four equal parts is shown by placing commas on each side of the half-pulse dot (:¹,².³,⁴||). The association of commas and quarter-pulses must therefore be built up

Ex. 64.—Sing to time names and to *laa*.

M. 60 to M. 90.

(*a*) | 1 :1 .1 | 1 :— | 1,1.1,1:1 .1 }
| 1 .1 :1 ||

(*b*) | 1 :1,1.1,1 | 1 .1 :1 | 1,1.1,1:1 }
| 1,1.1,1:1 ||

(*c*) | 1 .1 :1 | 1,1.1,1:1 | 1,1.1,1:1 .1 }
| 1,1.1,1:1 ||

(*d*) | 1 1.1,1:1 | 1 .1 :1 | 1,1.1,1:1,1.1,1 }
| 1 .1 :1 ||

The following exercise varies the tune of the same rhythmic form.

Ex. 65.—Sing to time names, *laa*, and in tune and time.

Doh is C, M. 60 or 70.

(*a*) | d :d | d,r.m,f: s | s.s.s,s: s . s }
| 1 . t : d¹ ||

(*b*) | d¹ : s | m,m.m,m: s | s,f.m,r: d . r }
| m . r : d ||

(c) | m :m | r,r.r,r: m | s,s.s,s: m . d }

| m . r : d ||

(d) | d :s | s,f.m,f: s | s,s.s,s: l . t }

| d^1 . d : d ||

Quarter-pulses are not difficult to sing when the tune repeats the tone struck first in the pulse, or when the tune moves from one tone of the scale to the tone next above or below. But they are difficult when leaps are made from tone to tone; as for example:—

| d :t_1,r .f ,l | s .m : s }

| d^1,s.m,l :s ,f .r,t_1 | l,s .f ,r: d ||

Such passages are too difficult for a pupil at the present stage.

Ex. 66.—Round for four parts with quarter pulses, etc.

Doh is G, M. 80.

1. | d : s_1 . s_1 | m : d }

| s : s . s | s ,l .s ,f : m }

2. | m : r . r | d : – . s }

| f . m : r . r | m,f .m ,r : d }

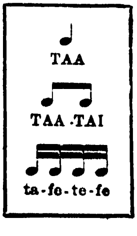
3. | s : — | s : m }

| r : s | d : — }

4. | d d .d ,d : t_1 . t_1 | d . d : s_1 . s_1 }

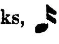
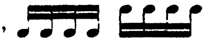
| t_1,t_1.t_1,t_1:t_1,t_1.t_1,t_1 | d . d : d ||

The first part or voice sings the first section (two lines) alone, the other parts beginning the exercise in turn when the previous part is beginning the following section.

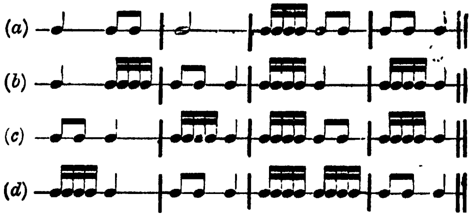


(STAFF NOTATION.)

Quarter-pulses—Semi-quavers.

When a crotchet stands for a pulse, quarter-pulses are shown by notes with *two* crooks,  or a double band,  called SEMI-QUAVERS, *i.e.*, half-quavers.

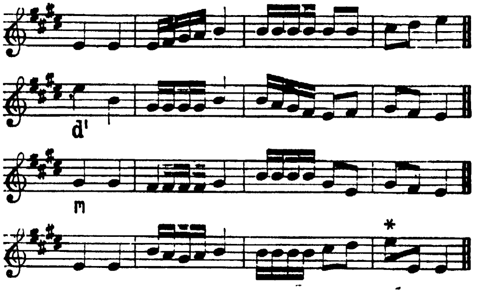
Ex. 67.—Sing to time names and to *laa.*



The exercises that follow are written with the proper signatures, to be explained later on.

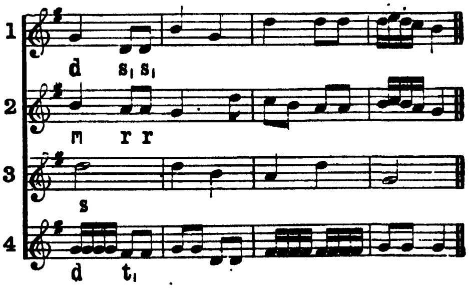
Ex. 68.—Sing to time names and in tune and time.

Doh is E (first line), M. 60 or 70.



Ex. 69.—Round with semi-quavers, etc. Monotone to time names, sol-fa in tune and time, and sing to *laa.*

Doh is G (second line) M. 80.



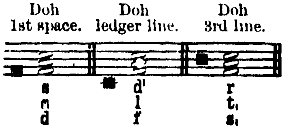
The FAH *Chord, or the Sub-dominant Chord.*

The combinations of *doh*, *me*, and *soh*, forming the chord of DOH, and of *soh*, *te*, *ray*, forming the chord of SOH, are imitated by the combination of *fah*, *lah*, and *doh*^{1} to form the chord of FAH. The general mental effect of the DOH chord is repose, because it is made up of the tones of repose; of the SOH chord expectancy, because it includes two expectant tones (*te* and *ray*); and of the FAH chord gravity or seriousness, because it includes the gloomy *fah* and the sorrowful *lah*. The only explanation that can be offered here of these singular effects is that they arise from the comparing powers of the mind's ear. Placed side by side, or sung from the same starting-point, it will be found that the three chords have precisely the same tune, because the tones in one chord are at the same distance from one another as are the tones in each of the other chords.

---

* Written thus when a downward stem is joined to an upward stem.

doh¹	**soh**	**ray¹**
lah	**me**	**te**
fah	**doh**	**soh**

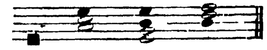


Of course the mental effects of the FAH and SOH chords are non-existent when the same combination is successively named **d m s**, **f l d¹**, **s t r¹**; they are felt only when the chords are presented in their proper relation of distance above and below one another.

A glimpse of the reasons why the middle chord has the effects of repose is gained by observing that whereas the FAH and SOH chords have no notes in common, the DOH chord shares *soh* with the SOH chord and *doh* with the FAH chord.

		ray¹
doh¹	**doh¹**	
		te
lah		
	soh	**soh**
fah		
	me	
	doh	

Doh 1st line.

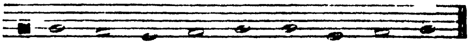


Chords: FAH DOH SOH

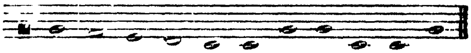
Replicates of FAH *and* LAH.

Fah below *doh* is only practicable to a singer when the *doh* is fairly high, or when a singer has a deep voice. It has a more pronounced sombreness than even its higher octave. *Lah* below *doh*, in the same manner, is an intensified version of its higher octave. In some surroundings low *lah* is most pathetic and beautiful. These effects are much better felt when the tones are approached by leap from the *doh* than when they are approached by singing step by step down the scale until they are reached. A good pattern from an instrument or, better, from a competent singer's voice, will much help the student at this stage. Failing this help, and assuming the ability of a student to sing up or down the scale, the following exercise may be found useful:—

Doh 2nd line.



Doh 2nd line.



TONIC SOL-FA NOTATION.

LAH *below* DOH (*shown by an octave mark below the letter, thus* l_1).

Ex. 67.—*Doh* is G.

s
f
m
r
d
t_1
l_1
s_1

| d : t_1 | d : s_1 | l_1 : — | s_1 : s_1 }
| l_1 : — | s_1 : s_1 | l_1 : — | t_1 : — }
| d : — | r : m | d : s_1 | l_1 : t_1 }
| d : — | r : — | d : — | d : — ||

Ex. 68.—*Doh* is E.

| d : m | d : s_1 | l_1 : — | t_1 : — }
| d : — | t_1 : d | l_1 : — | t_1 : — }
| d : m | s : m | m : — | r : d }
| l_1 : — | t_1 : — | d : — | d : — ||

Ex. 69.—*Doh* is A. Secondary measure (commencing with weak pulse).

: d | l_1 : — | t_1 : — | d : — | s_1 }
: d | l_1 : — | t_1 : — | d : — | d ||

Ex. 70.—THE OLD 100TH PSALM TUNE.

Doh is A or G.

: d | d : t_1 | l_1 : s_1 | d : r | m }
: m | m : m | r : d | f : m | r }
: d | r : m | r : d | l_1 : t_1 | d }
: s | m : d | r : f | m : r | d }

This tune should be committed to memory to the sol-fa syllables, and pointed (whilst being sung) on the marginal modulator above.

Ex. 71.—Illustration of **d** to l_1 and **l** to **d¹**. The frequent occurrence of **d** and **s** on strong accents occupies the ear with bold effects and draws attention from the special mental effect of **l**. *Doh* is G, F, E, or D, according to capacity.

AULD LANG SYNE. *Scotch Melody.*

: s_1 | d :-.d | d :m | r :-.d | r }

1. Should auld ac - quaint-ance be for - got,
2. We twa ha'e run a - boot the braes,
3 We twa ha'e pai - dl't in the burn,
4. And here's a hand, my trus - ty frien',

: m | d.d : — | m : s | l : — | — }

1. And ne - ver brocht to mind?
2. And pu'd the gow - ans fine
3 Frae morning sun till dine,
4. And gies a hand o' thine,

: d^1 | s :-.m | m : d | r :-.d | r }

1 Should auld ac - quaint -ance be for - got,
2. We've wan - dered many a wear - y fit,
3 But seas be - tween us, braid ha'e roar'd
4 We'll tak' a cup o' kind - ness yet,

: m | d :-.l_1 | l_1 : s_1* | d : — | — ||

1 And days o' Lang Syne?
2. 3 Sin' Auld Lang Syne.
4. For Auld Lang Syne.

Chorus after each verse:—

: l | s.m : — | m : d | r :-.d | r }
For Auld Lang Syne, my dear,

: m | s.m : — | m : s | l : — | — }
For Auld Lang Syne,

: d^1 | s :-.m | m : d | r :-.d | r }
We'll tak' a cup o' kind - ness yet,

: m | d.l_1 : — | l_1 : s_1 | d : — | — ||
For Auld Lang Syne.

The Pentatonic Scale.

d^1	Octave
·	(7)
l	6
s	5
·	(4)
m	3
r	2
d	1
·	(7)
l_1	6
s_1	5

The above tune illustrates a striking peculiarity of the construction of many Scotch melodies, namely, their formation from a SCALE OF FIVE TONES, or what is termed a PENTATONIC SCALE. It will be observed that the 4th (**f**) and the 7th (**t**) of the common major scale are avoided.

Another peculiarity often met with in the rhythm of Scotch melodies, and illustrated in "Auld Lang Syne," is the continuation of a note struck on the *second* half of a divided pulse through the following pulse, | **d . d** : — || (TAA-TAI AA). The performance should be quite smooth, *i.e.*, the continuation should not be emphasised.

FAH *below* DOH (*shown by an octave mark below the letter, thus* f_1).

m
r
d
t_1
l_1
s_1
f_1
m_1

Ex. 72.—*Doh* is F or G. f_1 from s_1.

d s_1 s_1 f_1 m_1 s_1 f_1 f_1 m_1 s_1 f_1 s_1 f_1 f_1 m_1.

Ex. 73.—*Doh* is F or G. f_1 from m_1.

d s_1 m_1 f_1 f_1 m_1 s_1 d s_1 s_1 m_1 f_1 s_1 m_1 m_1 f_1 s_1 m_1.

Ex. 74.—*Doh* is A or G. f_1 from d.

d t_1 d s_1 f_1 f_1 m_1 s_1 d f_1 m_1 d f_1 f_1 s_1 s_1 d.

Ex. 75.—*Doh* is F or E. f_1 to t_1.

d s_1 l_1 t_1 d s_1 f_1 t_1 d d f_1 t_1 d d f_1 s_1 d.

Ex. 76.—*Doh* is G. l_1 to f_1 (the FAH chord).

d s_1 l_1 s_1 f_1 f_1 m_1 s_1 l_1 f_1 m_1 d l_1 l_1 f_1 f_1 m_1 s_1 f_1 l_1 d.

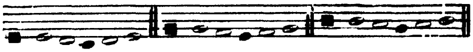
Ex. 77.—*Doh* is E or F. **d** to s_1 and **d** to f_1 contrasted.

: d | m : — | d : d | s_1 : — | d }
: d | l_1 : — | t_1 : — | d : — | d }
: d | m : — | d : d | s_1 : — | d }
: d | f_1 : — | s_1 : — | d : — | — ||

STAFF NOTATION.

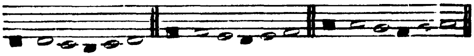
When doh is on a line, low lah is on the line below.

Illustration.



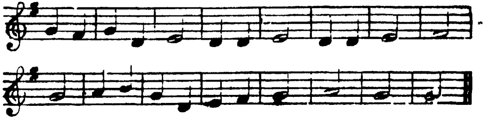
When doh is in a space, low lah is in the space below.

Illustration.



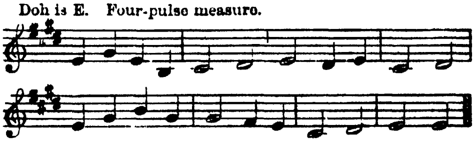
Ex. 70.

Doh is G. Two-pulse measure.



Ex. 71.

Doh is E. Four-pulse measure.



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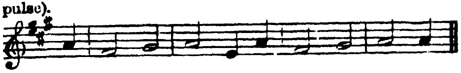
* The lines under notes show when two or more tones are to be sung to one syllable. They are called SLURS.

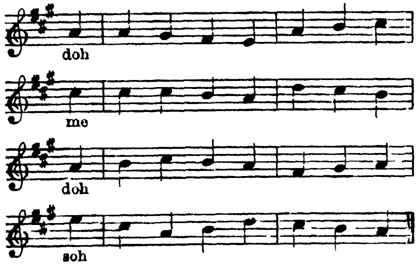
Ex. 72.

Doh is A. Four-pulse measure (commencing with weak pulse).



Ex. 73.—THE OLD 100TH PSALM TUNE

Doh is A Four pulse measure May be sung with G or F as doh, although of course it must be read with doh as A



This tune should be committed to memory to the sol-fa syllables, and pointed on a "blank" staff. *i e.*, five lines without notes

Degradation of William Sawtre.

HISTORIC SKETCHES, ENGLISH.—VIII.

(Continued from p 86.)

WILLIAM SAWTRE, HERETIC.

The history of mankind is like the surface of the sea: wave and hollow, crest and trough; each necessary to the other, and together making progress The annals of our own land—staid, somewhat phlegmatic people though we are supposed to be—are as full of revulsions of national temperament as those of any other country.

Nearly five hundred years have elapsed since the subject of this sketch presented itself, but the interest which it excited, and the principles which it brought into notice, can never die. We are all interested very deeply in the matter of freedom of conscience, freedom to worship God in the way suggested by the light He has given us; and we can never afford to lose sight of the principle then vindicated, even to the death, that it is not competent to a ruler to visit with the punishment of a crime a man whose sole offence consists in differing from his brethren on points of spiritual belief The first occasion on which this principle was vindicated in England was in 1401, and the man who was the first martyr to the cause of free conscience in England was William Sawtre.

William Sawtre was one of a numerous body who had been stirred to the very bottom of their hearts by the teaching of John Wiclif and his followers Wiclif had taught with as much boldness as ability that certain doctrines supported by the clergy of the day were erroneous, and contrary to the teachings of our Lord and His apostles; he taught that the Bible was the only standard by which men might measure the truth or falsity of their creeds; and he denounced in emphatic and, as it seems to us in these days, somewhat rough language, the vices and corruptions which had infected the clergy, especially in the monasteries. Upon these topics Wiclif preached with considerable effect at Oxford, where he was a professor, and in many other places. Attempts were made to silence him, but he spoke on and spoke out, and, strong in the protection of John of Gaunt, the Duke of Lancaster, brother to the Black Prince, and uncle to King Richard II., managed to weather the several storms which his opinions brought upon him. He was arraigned more than once before spiritual tribunals, and many of his opinions were declared to be erroneous, and many more were condemned as heretical, by an assembly of Church magnates. Ecclesiastical censures, however, were the only weapons with which the spiritual courts could enforce their decrees, and Wiclif was suffered to die a natural death at his rectory of Lutterworth, in Leicestershire, whither he retired after a life of unceasing toil and labour in aid of what he felt to be the truth.

After the death of Wiclif the spirit which had animated him passed into the breasts of his disciples, "the poor preachers," who went about with the English Bible (a new and forbidden article) in their hands, and preached so convincingly and cheeringly that, as was seen in the ministry of our Lord, "the common people heard them gladly." The attention of the Church authorities was soon drawn to them, and letters called bulls (on account of the *bulla*, or lead seal, which was attached to them) were sent from the Court of Rome, addressed to the Archbishop of Canterbury and the English bishops, to the University of Oxford, and to the king, commanding them each and all to help in suppressing the heretics, and in uprooting the tares (the Latin word for tare is *lolium*, from which the nickname "Lollard" may have been derived and affixed to the reformers), which, while men slept, the enemy had sown in the garden of the Lord.

Edward III., who died in 1377, was not a king to busy himself overmuch in such matters, unless the reformers in religion attempted to be reformers in the State also; but to Richard, his grandson, these exhortations of the Pope appeared in the light of a duty. Richard agreed to a law which was passed through a Parliament of which the Upper Chamber was at that time far more powerful than the Lower, and was composed of more spiritual than lay peers, by which it was ordered that preachers of heresy should be apprehended and imprisoned "till they will justify them according to the law and reason of Holy Church." No other punishment of a penal nature was permitted during this reign (1377–1399); but when Henry IV., in 1399, usurped the throne, and wanted the support of the clergy to back his bad title, he consented, as the price of their assistance, to a law called the Statute of Heresy, which was intended to crush out effectually the troublesome followers of Wiclif, who had increased in numbers and audacity during the late king's reign, and were leading many out of the fold of the Catholic Church. The Catholic Church said to them, "Holding opinions such as these, you are not of us, and we will have nothing to do with you while you continue to hold them." Had the Catholic Church stopped there, no one could have complained. Perfect liberty of conscience requires that men shall be free to choose what tenets they will embrace and what reject, but it forbids them to go farther and say to those who differ from them: "Think and believe as we do, for if you will not we will burn and hang you." The Church of the day would not act upon the advice given by Gamaliel to the Jews, who wished to persecute the Apostles: it could not bear the idea that anyone should presume to differ from what almost all Christendom accepted as true. Believing firmly that acceptance of all that the Church taught, and that in the system of government which the Church had established, was the only way to salvation, she was grieved beyond measure at the sight of her children going astray, and deemed any means, however violent, to be more than justified by the laudable end of bringing back the wanderers. She hoped to make such an example as would deter fresh truants, and she hoped even for the offenders that God would accept the suffering she inflicted upon them as an atonement for the sins they had committed against Him, supposing Him to be represented by the Pope and the Roman Church.

How easy does fanaticism of any kind cheat itself into the belief that its cause is God's cause, and that to persecute its own opponents is to do God service. The Church accordingly procured from the king in the year 1401 his assent to a law passed by a Parliament constituted as above described, by which persons who refused to renounce their so-called errors, or relapsing after they had so renounced them, were to be given over by the spiritual authorities to the sheriff, who "the same persons after such sentence promulgate shall receive, and them before the people in an high place see to be burned, that such punishment might strike fear into the minds of others, whereby no such wicked doctrine, and heretical and erroneous opinions, nor their authors, nor fautors (an old English word meaning favourers) in this realm and dominions against the Catholic faith, Christ's law, and determination of Holy Church, be sustained or in any wise suffered."

This infamous and dreadful law was the price paid by Henry for the support of the clergy, and the clergy, as has been suggested, believed they were only doing a meritorious deed when they procured the king's signature to the act. For a while the new power remained like a sword in its sheath; the clergy were almost afraid to handle the new weapon, till taking it out and looking at it with curious and admiring eyes, they perceived that they themselves were not called upon to do any of the dirty work. They were merely to find guilty or not guilty; upon the sheriff devolved the invidious task of execution. So they grew bolder, and the year following that in which the act was passed the Convocation of the province of Canterbury—an assembly of which all the bishops and abbots were members, and in which the inferior clergy appeared by their representatives—determined to draw the sword against those who dissented from their religious opinions.

Some persons who were brought before them were so terrified at the danger of standing firm that they recanted and renounced their belief rather than go to the stake. Let no man mock them for their weakness, but rather pity them, as men who might excusably fear lest they should be doing wrong in departing from the faith as delivered to them and as taught by the existing Church, which was presumed to have the Holy Ghost for its guide, and as men—many of them fathers and husbands—who feared to wrench asunder the ties which bound them to this world, who looked in their children's faces, and who listened to the entreaty of their wives, and then failed to pronounce the words which would make the children fatherless and the wives widows. Others there were, cast in another mould, who by their nature *could not* accept life as the price of their creed, who looked upon the offer with scorn, and asked if that were all they were to have in exchange for their souls. Equally enthusiastic with their persecutors, though in another direction, they made this matter "very stuff o' the conscience," and resolutely refused to abjure. Not among the physically strong only were these men found; indeed, the delicate and sensitive, and the men with highly strung nerves, were the boldest and most courageous professors of their faith. Such esteemed the claims of wife and child, of kindred and friends, as merely so many temptations, strong temptations no doubt, which must be overcome, and they pointed for their justification to the words of the Saviour, where He declared that the man who loved wife and children and friends more than Him was not worthy of Him, and they clung exultingly to the assurance, "There is no man that hath left house, or parents, or brethren, or wife, or children, for the kingdom of God's sake, who shall not receive manifold more in this present time, and in the world to come life everlasting."

Of this class was William Sawtre, priest of St. Osith's. It is not told us if he was a married man (the rule by which celibacy was the appointed lot of the clergy was not yet of universal application)—indeed, the chroniclers of the time speak very little about him and his case, one of them, Thomas Walsingham, monk of St. Alban's, merely mentioning that "a certain false priest was burnt in Smithfield in the sight of many people." But married or not, he seems to have been a very good and honest man, bold to speak and preach the truth, according to his vision of it, in his parish church of St. Osith, Wood Street, in the City of London. His character, so far as we know it, or can judge of it from his behaviour before his judges and at his execution, would seem to have been not unlike that of the "poor parson of a town," of whom Chaucer wrote:—

> "To draw folk to heaven by fairnesse,
> By good ensample was his business."

His opinions, however openly expressed, were in direct opposition to what the Church authorities permitted, and were in strict accordance with the teaching of Wiclif. He was cited to appear before his bishop, the Bishop of London, and was ordered to renounce his error; but this proceeding proving ineffectual, and his preaching continuing to attract many, he was summoned before the Convocation of the province of Canterbury, and put upon his trial for heresy, as in a court of justice.

Earnestly the charge was pressed, and boldly was it met, till argument for the defence was answered with invective by the prosecution, and the prisoner stood loaded with obloquy. This, however, was not hard for a man like Sawtre to bear; the most difficult and trying part for him, the real temptation, lay in the entreaties of his friends—and they were many—and the friendly prayers even of his judges, that he would be converted and live. But even against such mighty levers the man's mind was proof. "Whether it be right in the sight of God to hearken unto you more than unto God, judge ye," was the answer he gave back, and nothing could persuade him but that he spoke by the inspiration of God.

Faithful as his friends called him, obstinate heretic as his enemies called him, William Sawtre was ready to die, if need were, for his religion. Horrible to relate, that sacrifice was required of him.

Before Sawtre was given over to the secular arm it behoved that he should be degraded from his rank in the Church. This, accomplished by means of a ceremonial of which every part told with bitterness upon the poor prisoner, was submitted to with a patience worthy of the sufferer. Into the church, wherein were gathered a large company of the bishops and clergy, Sawtre was brought, attired in the robes and furniture appertaining to him as a priest. Set in the midst, the observed of all observers, he was gradually denuded of the various emblems of his pastoral authority, prior to being handed over to the tender mercies of the sheriff and his officers.

First, they gave into his hands a chalice and paten, which were then taken from him, together with the scarlet robe or chasuble which priests only might wear, and in this way his authority as priest was visibly taken away from him. A copy of the Holy Scriptures in Latin, and the deacon's stole or tippet were then taken from him, and he ceased to be a deacon; the alb or surplice, and the maniple were removed, and with them the dignity of subdeacon; the giving and taking away of a candlestick, a taper, and a small pitcher showed that the degree of acolyte had been abandoned; and then followed other forms, which signified the completeness of the poor man's degradation. With his book of exorcisms he gave up his power as an exorcist: with his book of daily lessons his task of reader; with a sexton's gown and a church-door key his authority as sexton; and then, his priest's cap being removed, the tonsure, or hair-lock, was obliterated, and a common hangman's cap was put on his head.

What follows? A scene too awful, too horrible to be minutely described. Let a veil be drawn over the details; let us "provide a charitable covering for the sins of our forefathers." Suffice it to say, that on a gloomy February evening in the year 1401-2, the man whose sole crime was that he believed differently from his ecclesiastical masters, and taught men so, was bound with an iron chain to a stake at Smithfield, and burned to death on a spot nearly in front of the present gate of St. Bartholomew's Hospital.

He was the first of many who were tried by bigotry in the fiery trial of their faith, and showed themselves superior to their fate. Not all the blame must fall on Catholic shoulders. Unhappily, alas! it is the duty of the historian to record that those who might be supposed to have learned tolerance and kindness, if not from the purer faith which they professed, yet in the hard school of persecution through which they had passed, proved themselves almost equally cruel with their adversaries.

See:—Cassell's History of England; Brougham, *England under the House of Lancaster;* Lewis, *Life of Wiclif.*

ENGLISH.—VIII

[Continued from p. 89.]

THE ARTICLES (*continued.*)

OMISSION OF THE ARTICLE.

THE rules we have laid down for the use of the article must not be regarded as inflexible. At different periods in the growth of the language the use of the article has varied, and it is very frequently omitted where, if the rules above set forth were rigidly adhered to, we should expect to find it. We will now briefly enumerate the cases in which the article may be omitted.

(1) The article is always omitted when the substantive which it would otherwise precede follows a genitive case. This rule admits of no exception. Examples :—

"The tears stood in *the good woman's eyes.*"
"He cut the Highland-fling by way of ridicule *of his wife's anxiety.*"

If a prepositional phrase had been used instead of the genitive in the above sentences we should have read "in *the* eyes of the good woman" and "of *the* anxiety of his wife."

(2) The article is omitted in titles and addresses. Thus, if "general" or "archbishop" are used as titles, no article precedes them. Thus, one says "General Roberts," "Archbishop Benson"; but we speak of "the general of all the forces," and "the Bishop of London." A similar difference of usage will be observed if you compare the two following sentences :—

"*The* jurymen retired to consider their verdict."
"Gentlemen of the jury, I feel sure that I shall be able to convince you of my client's innocence."

(3) The article is sometimes omitted before superlatives, used as predicates or attributes, and always in addresses :—

"Most puissant sovereign!" "Most learned judge!"
"He was most kind." "You were last on the list."

(4) In prepositional phrases the article is constantly omitted. Here the usage has altered considerably. There are many phrases in which the article is now omitted, but in which in Shakespeare's time the article was still used. For instance, we now say *in favour of*, *in full*, *at length*, &c. But *in the favour of*, *in the full*, were once customarily written. On the other hand, the article is omitted in many phrases in Shakespeare in which it is always written nowadays. Examples :—

"For honour of our land." "In number of our friends."
"In absence of thy friend."

The article is omitted especially before nouns denoting places, buildings, &c., and parts of the body. Examples :—

In town. At church. To college. By heart. Under foot.

When adjectives are followed by a prepositional phrase the article is often omitted after the preposition. Examples :—

Hard of heart. Keen of eye. Sound in wind and limb.

(5) In poetry, inanimate objects, which as a rule take the article, are sometimes personified, and then the article is omitted. Of this usage we have already given a few instances. Example :—

> " Or whether *war's* avenging rod
> Shall lash all Europe into blood."

(6) When several nouns follow one another in succession the article is often omitted, to give a sense of rapidity to the phrase. Example :—

> " *Palace, duomo, tower*, all glittered."

(7) Closely allied to the last usage is the picturesque omission of the article in phrases in which the same noun is repeated. Examples :—

> " *Shout* replies *to shout*."
>
> " Now as in a glass darkly, but then *face to face*."

(8) When a noun completes the predicate, especially in conditional sentences, the article is often omitted. Example :—

> " An age of gold all radiant should appear,
> If I were *king*."

(9) The article is omitted in comparative sentences, especially after *like* and *as*. In Shakespeare this was quite common, but in modern English it is chiefly confined to a few phrases, such as " clear as daylight," " black as night," &c. The following examples are from Shakespeare :—

> " The why is plain *as* way to parish church."
>
> " Then the whining schoolboy, . . . creeping *like snail*
> Unwillingly to school."

(10) A noun put in apposition to another, which would be preceded by the article if it stood alone, is often found without the article. Example :—

> " King Robert of Sicily, *brother* of Pope Urbane
> And Valmond. *Emperor* of Allemaine. '

(11) Lastly, it must be pointed out that in the English of Spenser and even of Shakespeare the article is frequently omitted for no apparent reason, save the exigencies of sound and metre. Modern poets more rarely take this licence. We give a few examples, and for others would refer the reader to Dr. Abbott's *Shakespearian Grammar* * :

> " And seizing *cruell clawes* on *trembling brest*."
>
> " *Faire virgin*, to redeem her dear,
> Brings Arthure to the fight."
>
> " When *lion rough in wildest rage* doth roar."

THE PRONOUNS.

Pronouns are words which are employed to represent nouns. They may be either substantives or adjectives, and they may be used for any noun. The Hindu title for them, " name for everything," " universal designation," sufficiently expresses their nature. " There is nothing," says Whitney, " which may not be *I* and *you* and *it* alternately, as the point from which it is viewed." Pronouns are not found in the earlier stages of language. Society must have made considerable progress before the relations indicated by pronouns would receive appropriate terms. This is exemplified in the language of children. Before a child can say, *I want my hat*, he has learned to say, *John wants John's hat*, the repetition of the noun performing the office of the possessive pronoun. Pronouns may be divided into five main classes. These are : (I.) Personal, (II.) Demonstrative, (III.) Interrogative, (IV.) Relative, (V.) Indefinite. We shall consider each of these classes in detail.

I. PERSONAL PRONOUNS.

Personal pronouns may be divided into two groups : (i.) Substantive pronouns, (ii.) Possessive or Adjective pronouns.

(i.) *Substantive Pronouns.*

There are *three* personal substantive pronouns, leaving the reflexive pronoun out of consideration for a moment, called respectively the first, second, and third personal pronouns. The first person is the person speaking, the second person is the person spoken to, and the third person is the person or thing spoken of. Thus it will be seen in a dialogue that as speech passes from one to the other, the first and second persons continually change place. As to the third personal pronoun, we may as well point out here that by many modern grammarians it is classed among the demonstrative pronouns. We have, however, thought it better to preserve the older and more familiar classification. All the personal pronouns undergo inflections of case and number, and the third personal pronoun exhibits also inflections of gender. It is noticeable, that with the exception of the genitive case of nouns in *'s*, the pronouns afford us the only instances in English of inflections of case.

		FIRST PERSON.	SECOND PERSON.	THIRD PERSON.
Sing.	*Nom.*	I.	Thou.	He, she, it.
	Gen.			
	Dat.	Me.	Thee.	Him, her, it.
	Acc.	Me.	Thee.	Him, her, it.
Plur.	*Nom.*	We.	You or ye.	They.
	Gen.			
	Dat.	Us.	You.	Them.
	Acc.	Us.	You.	Them.

The genitive of the pronouns is formed by the preposition *of* and the accusative of the pronoun, while sometimes the preposition *to* precedes the dative case. This, however, is not invariable, and we shall have something further to say on the subject later.

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* We take this opportunity of acknowledging our obligation to this admirable book, from which we have borrowed many examples.

(a) The first person.

I. The nominative of the first personal pronoun was once terminated with *k*, *c*, or *ch*, being etymologically connected with the Latin *eg-o* and the German *ich*. The *c* or *ch* disappeared very early in the history of the language. In old English we find *Ichabbe* and *Ichille*, for *I have* and *I will*, and similar abbreviated forms are still to be found in some dialects, but in the language as written and spoken by educated people *I* is the only form of the nominative singular of the first personal pronoun. It is used to denote the person who is speaking. The only irregularity to which we have to call attention with regard to it is its confusion with *me*, the accusative case. In dialects this confusion is very common with all the pronouns, and traces of it are to be found in the writings of the best authors. It need scarcely be pointed out here that it is an idiom which should not be imitated. The following examples are from Shakespeare:—

> "All debts are cleared between you and *I*."
> "Unless you would devise some virtuous lie,
> And hang some praise upon deceased *I*."

Me. The dative *me* was once terminated by an *r*, just as *mir* is in modern German. The use of the cases in English, as we have already shown, has almost vanished from our language, prepositions having usurped the place of case-endings. There are, however, still left in English some indisputable instances of *me* used as a dative case. For example, *me* as a dative is often found before impersonal verbs—*e.g.*, *me*thinks, *me*seems. With this you may compare the Latin *mihi videtur*. The dative *me* is also used after some interjections. For instance in the expression "Woe is *me*," *me* is a dative, and finds an exact parallel in the Latin "Vae mihi." Then again it is used as the ordinary indirect object—*e.g.*, give *me* the key.

This idiom belongs to our modern English, but in earlier times it had a more widely-extended use. Shakespeare, for example, writes: "Sayest thou *me* so?" but this is hardly allowable in the language of to-day. A curious use of the dative *me*, which is unknown now, is its use as what in Latin would be called the ***ethical*** dative.* This ***ethical*** dative expresses a kind of interest which the speaker takes in the action of the verb. Thus we find in Shakespeare:

> "See how this river comes *me* cranking in!"

A link between the ordinary dative of the indirect object and this so-called ethical dative is to be found in the line—

> "Villain, I say knock *me* at this gate and rap *me* well."

Me. The accusative *me* also once had its termination. It ended in *c*. *mec*, and so resembled the German *mich*. It is interesting to observe how the loss of inflectional terminations renders the extended use of prepositions, or some other artifice, necessary to render clear a distinction which once was made by inflection. For instance, as long as the dative and accusative of the first personal pronoun were *mer* and *mec*, there was no need ever to use the preposition *to* before the dative case. But the loss of *r* and *c* rendered this inevitable in many instances. The accusative *me* is frequently found for the nominative *I*, especially after particles of comparison. Example:—

> Is she as tall as *me*?

This has come to be considered a vulgarism now, and should be scrupulously avoided.

We, the nominative plural of the first personal pronoun, is used to denote the speaker and some one or more other persons. Of its normal use it is unnecessary to give any examples; these the student can frame for himself. There are one or two uses of *we*, however, which require a word of comment. Kings, queens, and other august personages use *we* when only one person is intended. Examples:—

> "And *we* beseech you, bend you to remain
> Here in the cheer and comfort of *our* eye,
> *Our* chiefest courtier, cousin, and *our* son."
> "*We*, Victoria, by the Grace of God," &c.

We is also used to denote only one person in articles in journals and anonymous writings generally. This is called the ***editorial we***. It will be quite easy for you to find instances of this in any newspaper you pick up. We will therefore content ourselves with giving one example:—

> "*We* trust that by this time *we* have seen the last of these intrigues, which in the last few weeks have done so much to damage the popular cause."

Us stands both for the accusative and dative plural of the first personal pronoun. Its use as a dative without the preposition *to* is limited to the sentences in which it is the indirect object. With regard to the accusative, the only point which demands comment is its use instead of *we*. In provincial English it is quite common still to say ***shall us*** instead of ***shall we***, but in the literary language of to-day such a phrase would be impossible. In Shakespeare's time, however, it was not unusual. Examples:—

> "Shall '*s* attend you there?"
> "Shall '*s* to the capitol?"

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* In Latin the usage is frequent—*e.g*, "Quid *mihi* Celsus agit?" *What is* my *Celsus doing?*

What we said concerning the *we* of authority and the editorial *we* applies with equal force to *us*.

(b) The second person.

Thou. The second person singular of the personal pronoun has almost disappeared from the language of everyday life. It is still used by some Quakers, but even within the limits of that body it is not heard so often as formerly. In the literary language it is still employed (1) in prayers and addresses to the Deity; (2) in poetry and archaic prose; (3) as a means of expressing contempt. Examples:—

> (1) "As *thou* hast given him power over all flesh, that he should give eternal life to as many as *thou* hast given him."
>
> (2) "But *thou*, who hast no lady, canst not fight."
> "Knowest *thou* aught of Arthur's birth?"
> "*Thou* art minded to wend away from home; ill-counselled is that; abide till another time."
>
> (3) "The devil damn thee black, *thou* cream-faced loon."
> "Hast *thou* or word, or wit, or impudence,
> That now can do thee office?"

Thou had been partially superseded by *you* even before the time of Chaucer, and in the time of Shakespeare it was only used in distinct and particular cases. It was then, to quote from Dr. Abbott's *Shakespearian Grammar*, "very much like *du*, now among the Germans, the pronoun of (1) affection towards friends; (2) good-humoured superiority to servants; and (3) contempt or anger towards strangers." Examples:—

> (1) "Come, say, Lucetta, now we are alone,
> Wouldst *thou* then counsel me to fall in love?"
>
> (2) "Hail, brave friend!
> Say to the king the knowledge of the broil
> As *thou* didst leave it"

Of the third use of *thou* in Shakespeare we have given examples above.

It is worthy of notice that in modern English *thou* is never used among intimate friends as *du* is in German, and *tu* in French. In conversational language indeed it is never heard under any circumstances whatever.

Thee is both the dative and accusative of the second personal pronoun. As a dative, sometimes it is used alone, just as *me* is; more generally it is preceded by a preposition. Of *thee*, as an accusative, there is little to say. The only noticeable peculiarity with regard to it is its use as *thou*. Many old-fashioned Quakers habitually say *thee* instead of *thou*, though this usage will soon be nothing but a memory. Instances of this are to be found in literature: *e.g.*—

> "I would not be *thee*, nuncle."

In the English of the sixteenth century and earlier, *thee* was frequently used for *thou* after imperatives; thus, such phrases as "haste *thee*," "come *thee*," "go *thee*," &c., are of common occurrence. The explanation of this idiom is, however, euphonic—that is to say, in rapidly uttering a command *thou* was found to be too heavy a word, and so the easier *thee* was substituted for it.

You, ye. In every-day conversational English *ye* is never used. In modern poetry it is sometimes used, and hardly differs from *you*. Perhaps it is a little more pompous and rhetorical than *you*, but the distinction between the two words is not marked. Originally *ye* was the nominative form, while *you* served as the dative and accusative. If you turn to the Bible you will find that this rule is always observed. We quote a few examples here. You can add to them indefinitely for yourself:—

> "*Ye* know that after two days is the feast of the Passover."
> "The poor *ye* have always with *you*."
> "For whosoever shall give *you* a cup of water to drink in my Name, because *ye* belong to Christ, verily I say unto *you*, he shall not lose his reward."

In Shakespeare, however, confusion between the two is complete; *ye* is used as an accusative, and *you* as a nominative. If any rule is observed in the Elizabethan writers it is the same rule which is followed to some extent in modern poetry; *ye* is used in addresses and rhetorical passages. Examples:—

> (1) [*You* for *ye*.]
> "O, *you*, sir, *you*, come *you* hither, sir."
>
> (2) [*Ye* for *you*.]
> "The more shame for *ye*; holy men I thought *ye*."

In the following passage from the *Tempest* you will notice that Shakespeare begins by using *ye* in his address, but soon goes back to *you*.

> "*Ye* elves of hills, brooks, standing lakes and groves;
> And *ye*, that on the sands with printless foot
> Do chase the ebbing Neptune, and do fly him,
> When he comes back; *you* demi-puppets, that
> By moonshine do the green-sour ringlets make,
> Whereof the ewe not bites; and *you*," &c.

No satisfactory explanation has been offered for this curious confusion of *ye* and *you*. It has been suggested that the substitution of *ye* for *you* is due to euphonic reasons, that in rapid utterance *ye* came more easily to the tongue than *you*. This is all right as far as it goes; but it only solves half the problem. It leaves the substitution of *you* for *ye*, a harder for an easier sound, unexplained. In this uncertainty we must leave the matter.

In certain phrases such as "look *ee*," &c., *you* or *ye* is changed to *ee*. This change is frequent in some dialects. In the dialect of Somersetshire, for instance, *ee* invariably takes the place of *you*.

(c) The third person.

He, she, it. There is little in the use of the so-called third personal pronoun to call for remark.

In dialects *a* is found for *he, she*:—

> "Well, let his father be about what *a* will, we talk of young master Lancelot."

This form occurs especially in expressions like "quoth *a*." *He* and *she*, like the nominative of the other personal pronouns, are found for *him* and *her*. Examples:—

> "And yet no man like *he* doth grieve my heart."
> "Praise him that got thee, *she* that gave thee suck."

He and *she* may also be used as nouns. To this usage we have referred above (Vol I., p. 108). Examples:—

> "The blameless *He* whose nod is Nature's birth."
> "The fair, the chaste, the unexpressive *she*."

You will notice that when *he* and *she* are used as nouns they may be qualified by adjectives.

It is primarily used to denote things without sex, or things to whose sex attention is not called. Examples:—

> "The owner could never lay his hands upon any one article at the moment he has occasion for *it*."
> "The child was still quite small; *it* could scarcely walk."

But there are several other uses of *it* to which attention must be called.

(*a*) *It* is sometimes used in an indefinite vague connection: *e.g.*—

> "Who is *it* knocking at the door?"

(*b*) It follows some intransitive verbs, as a kind of indefinite object, and in this case it has the effect of changing the intransitive to a transitive verb: *e.g.*—

> "We'll trip *it* on the green."
> "Lord Angelo dukes *it* well."

In modern English this last-mentioned usage is rare except in such colloquial, almost vulgar expressions as "to boss *it*," "to lord *it* over one," &c.

(*c*) *It* may stand for or refer to a whole sentence: *e.g.*—

> "The enterprise of the government will be entirely successful. Who doubts *it?*"
> "*It* is the pest of our profession that we seldom see the best side of human nature."

You must remember that *it* is used as an accusative as well as a nominative, and that all that we have said refers to one case as well as the other.

Frequently *it* is abbreviated to *'t*. Example:—

> "*'T*would be no disparagement to my taste if I were."

Him is used both as a dative and accusative. As a dative it is generally preceded in modern English by a preposition, though its use without a preposition in earlier English was quite common. It is, as far as its form is concerned, a dative and not an accusative. Old English had a separate form for the accusative, but this has fallen out of use, and *him* does duty for both cases.

Him is sometimes used instead of *he*, particularly when it is an antecedent to a relative which is omitted. Thus, in the following passage from Shakespeare:—

> "*Him* I accuse,
> By this the city ports hath entered,'

him stands for *he whom*, and *whom* being omitted, we have *him* instead of *he*, although this is hardly in accordance with the rules of grammar.

Her. Like *him*, *her* was originally only a dative case, but it now serves the double purpose of dative and accusative. As a dative, as has been said to be the case with the other pronouns, sometimes it is used alone, sometimes with prepositions. Its usage suggests no difficulty, and we need not devote further space to its consideration.

They serves as the nominative plural of the third personal pronoun of all genders. In some dialects, *a*, which, as you have seen, is used for *he* and *she*, takes the place of *they*. *They* frequently has an indefinite signification, "people," "the world at large." It then corresponds to the French *on*, the German *man*—*e.g.*, *they* do say.

Them is the dative and accusative plural of the third personal pronoun of all genders. It is etymologically only a dative, but the accusative form, which was *thâ*, has dropped out of use, and *them* has taken its place.

A common abbreviation for *them* is *'em*. In conversational language the abbreviated form is generally used, and it is to be found in literature. The same confusion exists between *them* and *they* as exists between the nominative and accusative of the other personal pronouns.

ASTRONOMY.—VIII.

[*Continued from p. 60.*]

SHOOTING STARS—METEORITES—ECLIPSES—ASTRONOMICAL INSTRUMENTS.

SEVERAL shooting stars are observed on every clear night. They are sometimes more abundant than at others, but the sky is never watched very long without some being seen.

Humboldt witnessed an extraordinary fall of these bodies on the night following November 11th, 1799. He says that "thousands of bolides and falling stars succeeded each other during four hours. From the beginning of the phenomenon there was not a space in the firmament equal in extent to three diameters of the moon which was not filled every instant with these bodies." Another display occurred on November 12th, 1833, and it was especially grand as observed in America. One writer says, "The scene was truly awful, for never did rain fall much thicker than the meteors fell towards the earth." It was noticed that the meteors projected luminous streaks upon the sky, and that their motions were directed from a common centre in the constellation Leo. This radiant point retained a fixed position with reference to the stars.

We now arrive at a period notable for its discoveries in this branch of astronomy. A small comet which had made its return to the sun in January, 1866, was found to agree in its path with an orbit computed for the November meteors. Another comet which had appeared in 1862 was found to similarly coincide with a well-defined meteoric display which had often been observed on August 10th. Here, then, was an obvious conclusion. The comets and shooting stars were following precisely the same courses, and must therefore be identical in their origin. In fact, the comets represent immense clouds of shooting stars; and dispersed along their orbits are streams of these little bodies, which the earth must necessarily encounter in its annual journey round the sun. More recent inquiries have amply confirmed these conclusions, so that they now rest on a basis equally as firm as the other well-approved theories of astronomy.

The following is a list of the principal meteor showers, and a few facts concerning them :—

Date.	Radiant Point.		Notes.
	R A.	Dec.	
January 2 . . .	230°	52° 5 +	Returns annually.
April 19-20 .	270	32 5 +	Lyrids. = Comet I. 1861.
May 2-6 . .	337	2 −	= Halley's comet.
July 27-31 .	339	12 −	Returns annually.
August 9-11	46	57 +	Perseids. = Comet III. 1862.
October 17-20	92	16 +	Orionids. Annual
November 11-14	150	23 +	Leonids. = Comet I. 1866.
November 26-27	25	44 +	Andromedes. = Biela's co-
December 9-12	108	33 +	Geminids. Annual. [met

Though meteors are cosmical in their origin, they are very close to the earth's surface when seen. They enter our atmosphere with an average speed of more than thirty miles per second, and the friction with the air has the effect of heating them to such a degree that they are immediately ignited and consumed. The ordinary shooting stars are seen falling from mean heights of eighty to fifty-four miles; while the larger meteors, called fireballs, are somewhat nearer to us, the heights being from sixty-nine to thirty miles, according to Mr. Denning's observations.

The ordinary falling stars are undoubtedly very small objects. It is believed they weigh only a few grains. But there appear to be several classes of these bodies. Some are so large and compact as to resist the destroying power of our atmosphere, and succeed in reaching the earth's surface. These are termed aërolites, and somewhat differ in their constitution. The majority are found to contain iron in a large proportion, and nickel is usually present.

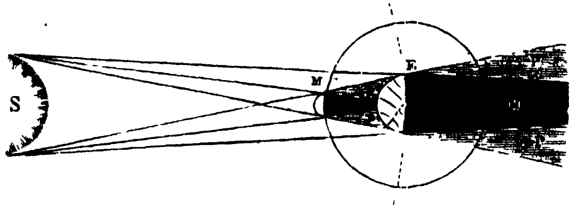

Fig 28.

ECLIPSES.

The varying motions of the earth and moon, and the successive positions they occupy relatively to the sun, sometimes bring them into the same line. If in this case the sun is at one extremity of the line, the body at the other extremity will be temporarily deprived of its light because it will be immersed in the shadow of the central one.

When the moon thus intervenes between the earth and the sun we have a solar eclipse, the moon cutting off the rays of the sun, and throwing her own dark shadow over a portion of the surface of the earth. Fig. 28 will explain this. Let S represent the sun, M the moon, and E the earth. The sizes and distances are of course thrown out of proportion, in order to render the figure more clear. As the moon travels on in her orbit she comes into the position shown (M^1), and then completely hides the sun from that part of the earth which happens to be in the line of her shadow. The central dark cone of shadow is called the *umbra*, the sun's rays being entirely cut off from it. Around this is a space from which only a portion of the sun's rays is excluded, so that the shadow is less dark. This part is known as the *penumbra* (P), and, as will be seen, the rays from some parts of the sun penetrate this, so that it is in reality a gradual shading off of the umbra. Those parts of the earth's surface over which the penumbra passes will experience a partial eclipse of the sun, only a portion of his disc being hidden by the moon. The nearer they lie to the line where the central shadow passes, the greater the portion of his disc which will be hidden.

The diameter of the umbra on the earth is never large, and averages about 150 miles, so that it is only along a tract of surface of this width that the eclipse will be seen as a total one. Its exact area varies with the distance of the moon from the earth. When the moon is at her greatest distance the umbra does not reach the earth at all. The moon then appears to be smaller than the sun, and does not completely hide it, but leaves a bright ring all round. This is known as an *annular* eclipse. It has been calculated that the greatest duration of an annular eclipse at the Equator cannot exceed 12½ minutes; a total eclipse cannot continue eight minutes.

Total solar eclipses at any given place are very rare occurrences. None were observed at London between the years 878 and 1715. Since 1715 not one has been seen at the metropolis, though in 1724 there was a total eclipse visible in some other parts of England. A search into the future has revealed the circumstance that during the next 500 years there will be no total solar eclipse seen at London.

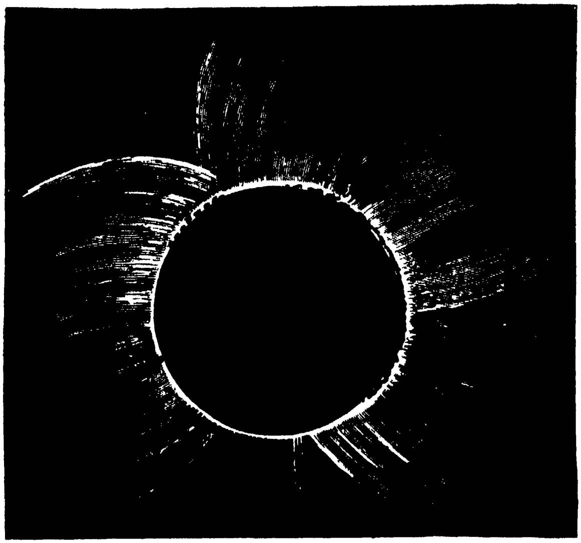

Fig. 29.—ECLIPSE OF THE SUN, JULY 29, 1878.

Many surprising appearances are perceptible at such times. The *corona* becomes visible as a brilliant white glow surrounding the eclipsed sun, and brilliant rays sometimes extend to considerable distances from the limb. (Fig. 29.) Red flames also dart out from the margin of the disc, and these the spectroscope proves to be uprushes of hydrogen gas. The red flames were first seen in 1706; they are rapidly variable. The corona seems to be subject to many changes as observed at different eclipses, the streamers and general distribution of the light being very inconstant both in intensity, form, and position.

Lunar eclipses are occasioned, by the moon passing through the shadow of the earth. They are visible over an entire hemisphere of the earth, while those of the sun are limited to a small area. It happens therefore that, though solar eclipses occur more often than lunar ones in the proportion of three to two, the latter are more frequently visible at any one place of observation.

The theory of lunar eclipses will be understood by a reference to Fig. 28. The shadow of the earth is a long cone reaching into space a great way beyond the orbit of the moon. This dark shadow is the *umbra*, and outlying this is the faint shade, the *penumbra*, which tapers towards the earth, instead of away from it.

The moon revolving around the earth, sometimes passes through the dark cone, and thus becomes, for the time, almost invisible. The commencement of the eclipse is marked by a faint shade beginning to creep over the east side of the moon's disc. The moment of this occurring is that mentioned in the tables as the first contact with the penumbra. As the moon travels onward it enters the umbra, and the east side of its disc then becomes almost invisible.

The duration of the total phase may be as great as 1 hour 50 minutes. This is when the moon passes directly through the middle of the umbra. At other times it may pass near the edge, and then is only obscured for a short period. When it passes through the centre of the shadow, the whole duration of an eclipse, from the first contact with the penumbra to the last, may be five hours and a half.

An eclipse of the sun can only take place at the period of the new moon, as the enlightened hemisphere is turned away from the earth. An eclipse of the moon, on the other hand, can only occur at full moon.

At first sight we should suppose from this that these eclipses ought to occur at every new and full moon, and the question naturally occurs why it does not happen so.

The simple answer is found in the fact that the orbit of the moon is not in the same plane as that of the earth, but is inclined to it at an angle of about 5° 9′, so that during one half of its journey the moon is below the plane of the ecliptic, and during the other half it is above it. Now the shadow of the earth is in the same plane as its orbit, and hence at the period of full moon the shadow may be above or below the moon, and in either case no eclipse will occur.

The position of the nodes of the moon's orbit is continually changing at the rate of 19° 20⅓′ in a year, so that they perform a complete revolution in a trifle less than 18 years and 219 days. After an interval of 346·62 days, however, they come again into the same position with regard to the sun, and this period is called a *synodical revolution of the node.* Now, it happens that nineteen of these periods are almost exactly equal to 223 synodical revolutions of the moon, so that after this interval the sun, earth, and moon are again almost in the same relative positions, and a similar series of eclipses is therefore repeated. This period of 6,585 days, or 18 years and 10 days, is called a *cycle of the moon.* It was known to the ancients, and called the *Saros,* and by its means eclipses were roughly calculated before any great progress had been made in the science of astronomy.

During this period of 18 years and 10 days there are 70 eclipses, of which 41 are solar, and 29 lunar. At each recurrence the magnitude varies slightly, so that after a time some pass off the list entirely, while others come to supersede them.

There cannot be more than seven eclipses in one year, nor less than two. If there are only two, then both will be of the sun. It may be as well to mention here that in a strict sense the word solar *eclipse* is not quite correct, for whenever one celestial body interposes itself before another it is called an *occultation.*

It rarely happens that one planet passes in front of another and occults it, but the large disc of the moon frequently hides the stars which lie in her path. The brightness of the moon is such, however, that only the occultations of the more conspicuous stars may be observed. The annual issues of the "Nautical Almanack" contain precise information as to the dates and particular stars that will be thus hidden for each year. Between the periods of new and full moon the stars suddenly disappear at the dark edge of her disc, and reappear as suddenly from the bright side, though the effect is not so striking. During the wane of the moon the stars are first hidden at the bright side and released from the dark side.

Rare instances have been recorded when one planet has occulted another or a fixed star. When planets approach near together, they are said to be in conjunction. Occasionally two or three planets are thus situated, but in 1186 Mercury, Venus, Mars, Jupiter, and Saturn were all in the same region.

ASTRONOMICAL INSTRUMENTS.

Before passing on to notice the main facts relating to the stars it will be well just to glance at the instruments employed by the astronomer in his researches. The most important of these is the telescope; in fact, it may be said that in nearly all his instruments the most essential portion is a telescope, the mode in which it is mounted varying according to the special purpose for which it is intended.

A full description of the principle on which the telescope acts would occupy too much of our space. Two objects are sought to be obtained by the use of this instrument. The one is to collect a much larger number of rays of light than can enter the unaided eye, and thus to render the illumination considerably greater, and discern objects too faint to be otherwise seen. The other is to cause those rays to enter the eye at a larger angle, and thus make the object appear nearer than it does to the naked eye.

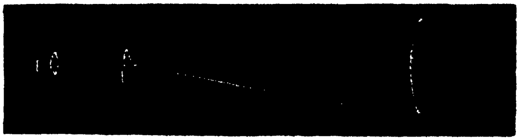

Fig. 30.

To accomplish these objects two different kinds of instruments are employed—the *refracting* and the *reflecting* telescope. The former consists essentially of a double-convex lens of considerable focal length, called the object-glass. The rays of light which fall on this are brought to a focus, and a second lens magnifies the image thus formed. Fig. 30 will illustrate this, O being the object-glass, which forms an image at A B, and E the eye-piece, which magnifies the image. The largest refracting telescope yet made has an object-glass 36 inches in diameter, and it will easily be seen how great must be the amount of light received by this when compared with the pupil of the eye, which is only one-fifth of an inch across. Earl Rosse's telescope is the largest reflector ever made, its speculum having a diameter of 6 feet. Telescopes of this kind consist of a long open tube, with the speculum placed at the lower end. The observer then looks in through a lens placed at the side.

The instrument usually employed when we want to examine the position of any celestial body is that known as a *transit instrument,* and represented in Fig. 31. Two pillars of solid masonry carry the bearings of the horizontal axis of the telescope. This axis points due east and west. The telescope therefore, which is at right angles to it, describes a great circle, passing through the north and south points of the horizon, and also through the pole of the heavens. Every star will therefore be visible in the telescope at the time of its culminating or crossing the meridian. Those circumpolar stars which never set will also be visible during their lower passage of the meridian.

We have now to learn the mode of taking observations. To one side of the axis there is affixed a large circle, not shown in the engraving. This circle is accurately divided into degrees and fractions of a degree, and in some of the best instruments—as, for instance, that at Greenwich Observatory—several apertures are pierced through the pillar, and microscopes are placed in these, so as to read very exactly the degree of the circle under them.

As the axis of the instrument is due east and west, the tube will of course point to a great circle passing through the north pole.

If a star were situated exactly at this point we could easily direct the tube to it, and arrange the graduated circle so that it should then read 0°: as, however, the pole star is not thus placed, we must observe carefully its position when it crosses the meridian above the pole, and again when it makes its lower transit. The true place of the pole is, of course, midway between these points, and the circle is adjusted accordingly.

If now we observe any star when it is on the meridian, we shall be able at once to measure its distance from the pole, and, by calculation, from the zenith. We have therefore one measure to fix its position; but, as we have seen, two are requisite to fix it definitely, since there may be a whole ring of stars at the same distance from the pole. The second measure is, however, easily obtained. In the observatory there is a clock made to indicate *sidereal time*—that is, the interval which elapses between two successive passages of the same star across the meridian. This clock is so adjusted as to indicate 0h. 0m. 0s. when the first point of Aries is on the meridian, and has of course passed round the twenty-four hours when that point returns to the meridian.

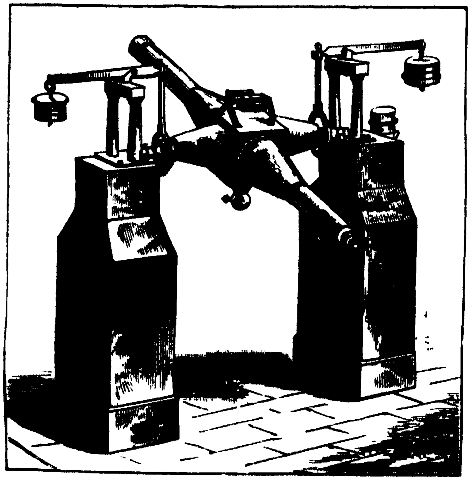

Fig. 31.—Transit Instrument.

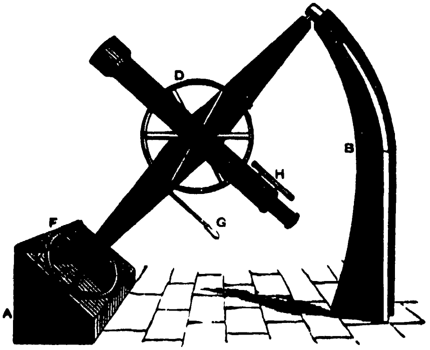

Fig. 32.—English Equatorial Telescope.

Now right ascension being also measured from the first point in Aries, we shall find that the clock will show us the right ascension of any star. In one hour the earth has revolved through 15°, or $\frac{1}{24}$th of 360°, and any star on the meridian after that interval must have 15°, or 1 hour of right ascension; similarly, every 4 minutes of sidereal time indicates 1°.

We see, then, that we can by a single observation with this instrument fix the place of any star. The graduated circle will give us its polar distance, and deducting this from 90° we have its declination; while by noting the time by the clock we at once learn its right ascension. Thus, if a star crossed the meridian at 13h. 13m. 30s., and its distance from the pole was 35°, we should at once know its declination was 55° N., and its right ascension 13h. 13m. 30s., or 198° 22½′. By observations of this kind the places of all the stars have been noted, and catalogues compiled giving their positions.

The only other kind of mounting for a telescope we will explain is that known as the *equatorial*. With any ordinary stand—as, for instance, that for the altazimuth instrument—two motions are requisite to keep a star in the field of view; both the observer's hands are therefore constantly occupied with the handles intended to impart a slow motion to the telescope, since, owing to the rapid rotation of the earth on its axis, the star would in a very few minutes pass out of the field of view if these adjustments were neglected.

All the heavenly bodies, however, appear to revolve round the pole; hence if we mount our telescope so that its axis shall point towards the pole, one motion will be sufficient to enable us to follow a star and keep it in view.

One of the modes in which a telescope may be thus equatorially mounted is shown in Fig. 32. This is known as the English equatorial. The axis, instead of being vertical, is inclined to the horizon at such an angle that it points to the pole; the inclination, therefore, has to accord with the latitude of the place. An instrument of this kind is usually made a fixture, and then the lower end of the axis turns in a bearing set in a block of masonry, A, while a strong support, B, bent over at the upper part, carries the other end.

The telescope is attached to a pivot which turns in the polar axis, and is carefully adjusted so as to be at right angles to it. The telescope thus moves in a plane parallel to the axis, and sweeps along a meridian. A graduated circle, D, is attached to it, and read off by means of a microscope or a vernier at E. The edge of this circle is cut into teeth, which catch in an endless screw on the rod G, and in this way a slow motion may be imparted to the telescope. By pressing the handle G downwards, the screw is removed from the teeth, and the telescope then moves freely to allow of a coarse adjustment or rapid motion.

A similarly divided circle, F, is affixed to the lower end of the axis C C, and serves to give the right ascension of any object, the graduations on it reading from I. to XXIV. hours. A slow motion handle is usually affixed to this, similar to that shown at G.

When the telescope is directed to any celestial object, the circle D may be clamped, as the star can be kept in the field by merely turning the circle F. In the best instruments a driving-clock, regulated to keep sidereal time, is added, and this causes the circle F to revolve in exactly 24 hours. All difficulty in the way of adjusting the telescope is thus removed, as it constantly remains directed to the object. It is by an arrangement of this kind that photographs of the heavenly bodies are taken.

The mode of using the equatorial requires a little explanation. The circle F is so adjusted as to read 0° when the telescope is directed to the meridian, and a sidereal clock notes the time of making the observation. Now suppose that we want to record the position of any star, we get it exactly in the centre of the field, for which purpose fine cross-wires are usually placed in the eye-piece. We then note the exact time, and read off the two circles. Suppose, for example, that the time is 10h. 45m., and the reading of the declination circle is 37° 20′, and that of the other 3h. 40m.; the star then had passed the meridian 3 hours and 40 minutes at the moment of making the observation; it was on it, therefore, at 7h. 5m., and this is its right ascension, while its declination is 37° 20′, and thus we know its position exactly.

One great advantage which the equatorial possesses over the transit instrument arises from the fact that observations may be made with it in any part of the heavens, while with the other a star can only be observed when on the meridian.

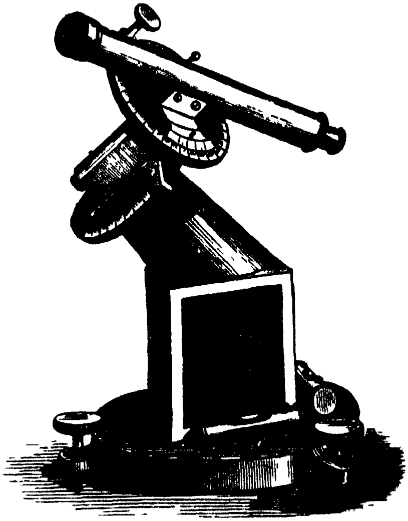

Fig. 33.—THE "STAR-FINDER."

A different mode of mounting an equatorial is represented in Fig. 33. This instrument, which is called the "star-finder," is mounted on the German, or the Fraunhofer system, which is that more usually adopted. The advantages it possesses over the English form are that stars near the pole may be observed with it, which the axis in the other prevents; and that only one support is required, and thus there is far less difficulty in fixing it accurately. The instrument shown here is portable, but in observatories the larger instruments mounted on the German plan are usually fixed to stone pedestals.

To nearly all telescopes of high power a small one is usually affixed to serve as a *finder* (H, Fig. 32). The power of this is but low, but it includes a large field, the centre of which is marked by means of cross-wires; and it is so adjusted that when the star is thus in the centre of its field it is also in the centre of the field of the large instrument.

ARITHMETIC.—VIII.

[Continued from p. 55.]

RATIO AND PROPORTION.

1. In comparing two numbers or magnitudes with each other we may inquire either by *how much* one is greater than the other, or *how many times* one contains the other.

This latter relation—namely, that which is expressed by the *quotient* of the one number or magnitude divided by the other — is called their *Ratio.*

Thus the ratio of 6 to 2 is 6 ÷ 2, or 3. The ratio of 7 to 5 is 7 ÷ 5, or, as it would be written, the fraction $\frac{7}{5}$. The two numbers thus compared are called the *terms* of the ratio. The first term is called the *antecedent*, the last the *consequent.* It will be seen that any ratio may be expressed as a fraction, the antecedent being the numerator, and the consequent the denominator. A ratio is, in fact, the same thing as a fraction. When we talk of a ratio, we regard the fraction from rather a different point of view, namely, as a means of comparing the magnitude of the two numbers which represent the numerator and the denominator, rather than as an expression indicating that a unit is divided into a number of equal parts, and that so many of them are taken.

2. The ratio of two numbers is often expressed by writing two dots, as for a colon, between them. Thus the ratio of 6 to 3 is written 6 : 3; that of 3 to 5, 3 : 5, etc.

The expressions $\frac{3}{5}$ and 3 : 5, it must be borne in mind, mean exactly the same thing.

A *direct* ratio is that which arises from dividing the antecedent by the consequent.

An *inverse* or *reciprocal* ratio is the ratio of the *reciprocals* * of the two numbers. Thus, the inverse ratio of 3 : 5 is the ratio of $\frac{1}{3} : \frac{1}{5}$, or otherwise expressed $\frac{\frac{1}{3}}{\frac{1}{5}}$, which is the same as $\frac{5}{3}$, or otherwise expressed, 5 : 3.

Hence we see that the inverse ratio of two numbers is expressed by inverting the order of the terms when the ratio is expressed by points, or by inverting the fraction which expresses the direct ratio.

A ratio is said to be *compounded* of two other ratios when it is equal to the product of the two ratios. Thus, $\frac{21}{40}$ is a ratio compounded of the ratios $\frac{3}{5}$ and $\frac{7}{8}$.

3. *Proportion.*

Different pairs of numbers may have the same ratio. Thus, the ratios $\frac{3}{4}$, $\frac{12}{16}$, $\frac{27}{36}$, are all equal.

When two pairs of numbers have the same ratio, the four numbers involved are said to form a *proportion;* and they themselves, in reference to this relation subsisting among them, are called *proportionals.* Thus, 3, 4, 12, 16 are proportionals, because the ratio $\frac{3}{4}$, or 3 : 4 = the ratio $\frac{12}{16}$, or 12 : 16.

A proportion is expressed either by writing the sign of equality (=) between the two equal ratios, or by placing four dots in the form of a square (thus, : :) between them.

Thus, the proportionality of 3, 4, 12, 16, might be expressed in any one of the three following ways:—

$$\frac{3}{4} = \frac{12}{16}; \qquad 3 : 4 = 12 : 16; \qquad 3 \;\; 4 : : 12 : 16.$$

The last expression would be read, 3 is to 4 as 12 is to 16.

The *first* and *fourth* terms of a proportion are called the *extremes;* the middle two, the *means.*

4. *If four numbers be proportional, the product of the extremes is equal to the product of the means.*

Take any proportion, 3 : 4 : : 9 : 12, for instance. Expressing this in the fractional form, we have $\frac{3}{4} = \frac{9}{12}$, and reducing these fractions to a common denominator 12 × 4, we get—

$$\frac{12 \times 3}{48} = \frac{4 \times 9}{48}, \text{or } 12 \times 3 = 4 \times 9.$$

Now, 12 and 3 are the extremes, and 4 and 9 are the means, of the given proportion.

Conversely, if the product of two numbers is equal to the product of any other two numbers, the four numbers will form a proportion. Thus, since—

8 × 3 = 6 × 4, 8, 4, 6, 3 form a proportion;
or, 8 : 4 : : 6 : 3.
Or we may write it thus, 8 : 6 : : 4 : 3;
or, 3 : 6 : : 4 : 8;
or, 4 : 8 : : 3 : 6;
or, 4 : 3 : : 8 : 6.

Thus we see that either product may be separated to form the extremes, and that, the order of either the means or the extremes being interchanged, the numbers still form a proportion.

5. If *three* numbers be given, a fourth can always be found which will form a proportion with them.

This is the same thing as saying that if three terms of a proportion be given, the fourth can be found.

Take any three numbers—3, 4, 5, for instance. Then we have

3 : 4 : : 5 : fourth term.

Therefore—

3 × fourth term = 5 × 4 (since the products of the means and extremes are equal).

Therefore, dividing both of these equalities by 3—

$$\text{Fourth term} = \frac{5 \times 4}{3}, \text{ the required number.}$$

---

* The reciprocal of a number or fraction is the number or fraction obtained by inverting it. Thus, the reciprocals of 5, $\frac{2}{3}$, $\frac{1}{6}$, etc., are respectively $\frac{1}{5}$, $\frac{3}{2}$, 6

Here we have found the fourth term, but we could in the same way find a number which would form a proportion with the three given numbers when standing in any of the terms. For instance, for the second term we should have—

$$8 : \text{second term} :: 4 : 5,$$

and therefore—

$$4 \times \text{second term} = 5 \times 8.$$

Hence, dividing both of these equalities by 4—

$$\text{Second term} = \frac{5 \times 8}{4},$$

and similarly for the other two terms.

The most important application of proportion is the solution of examples of this kind, where three terms of a proportion are given to find a fourth. This is what is usually called *Rule of Three*, which will be dealt with in a future lesson.

6. It is evident that if the two terms of a ratio be multiplied or divided by the same quantity, the ratio is unaltered.

Any set of numbers are said to be respectively proportional to any other set containing the same number when the one set can be obtained from the other by multiplying or dividing all the numbers of that set by the same number. Thus, 3, 4, 5 are proportional respectively to 9, 12, 15, or to $\frac{3}{7}$, $\frac{4}{7}$, $\frac{5}{7}$.

7. *To divide a given number into parts which shall be proportional to any given numbers.*

Add the given numbers together, and then, dividing the given number into a number of parts equal to this sum, take as many of these parts as are equal to the given numbers respectively.

Example.—Divide 420 in proportion to the numbers 7, 5, and 3.

$$7 + 5 + 3 = 15;$$

And therefore the respective parts are—

$$\tfrac{7}{15} \times 420 = 196.$$
$$\tfrac{5}{15} \times 420 = 140.$$
$$\tfrac{3}{15} \times 420 = 84.$$

These parts are evidently in the proportion of 7, 5, and 3, and their sum, $196 + 140 + 84 = 420$.

8. The same method will apply if the given number or quantity is to be divided proportionally to given fractions.

Example.—Divide 266 into parts which shall be respectively proportional to $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{4}{5}$.

Following exactly the same method as before, the answer, without reduction, would be—

$$\frac{\frac{2}{3}}{\frac{2}{3}+\frac{3}{4}+\frac{4}{5}} \times 266,\ \frac{\frac{3}{4}}{\frac{2}{3}+\frac{3}{4}+\frac{4}{5}} \times 266, \text{ and } \frac{\frac{4}{5}}{\frac{2}{3}+\frac{3}{4}+\frac{4}{5}} \times 266.$$

Or we may proceed thus :—

Reducing the fractions to their least common denominator, which is 60, we get—

$$\tfrac{40}{60},\ \tfrac{45}{60}, \text{ and } \tfrac{48}{60}.$$

Now these fractions are proportional respectively to 40, 45, 48.

Hence we have to divide 266 in the proportion of 40, 45, and 48, to which the required answer is, since $40 + 45 + 48 = 133$,

$$\tfrac{40}{133} \times 266,\ \tfrac{45}{133} \times 266, \text{ and } \tfrac{48}{133} \times 266,$$

or 80, 90, and 96.

Exercise 51.

Find in their simplest form :—

1. The ratio of 14 to 7, 86 to 9, 8 to 32, 54 to 6.
2. The ratio of 324 to 81, 792 to 99.
3. The inverse ratio of 4 to 12, and of 42 to 6.
4. Find the fourth term of the proportions, 8 : 5 :: 6 : —; 4 : 8 :: 9 : —; $\frac{1}{3} : \frac{2}{3} :: \frac{2}{5}$: —.
5. Insert the third term in the following proportions—3 : 5 :: — : 6; 4 : 8 :: — : 9; $\frac{1}{3} : \frac{2}{3}$ :: — : $\frac{2}{5}$.
6. Insert the second term in the following proportions—3 : — :: 5 : 6; 4 : — :: 8 : 9; $\frac{1}{3}$: — :: $\frac{2}{3} : \frac{2}{5}$.
7. Insert the first term in the following proportions— — : 3 :: 5 : 6; — : 4 :: 8 : 9; — : $\frac{1}{3} :: \frac{2}{3} : \frac{5}{6}$.
8. Find a fourth proportional to $2{\cdot}13$, $\cdot 5\dot{7}\dot{9}$, and $3{\cdot}14\dot{1}59$, correct to 5 places of decimals.
9. Divide 100 in the ratio of 3 to 7.
10. Two numbers are in the ratio of 15 to 84, and the smaller is 75; find the other.
11. What two numbers are to each other as 5 to 6, the greater of them being 240?
12. Two numbers are in the ratio of 16 to 27, the smaller being 112; find the other.
13. Divide 921 in the ratio of 1 to 3.
14. Two numbers are in the ratio of 18 to 91, the larger being 3549; find the smaller.

CONCRETE OR COMMERCIAL ARITHMETIC.

1. We have hitherto been concerned with what are called *abstract* numbers—that is to say, numbers *abstracted* from their connection with any special thing, object, or magnitude; and we have established all the principles connected with them which are necessary to be known by the student of elementary arithmetic. We now proceed to apply these principles to *concrete* numbers—that is to say, to numbers which indicate some actual magnitude, object, or thing—as, for instance, time, money, length, etc.

Theoretically, we are already in possession of principles which enable us to perform any calculation with reference to any concrete number. Take length, for instance. Suppose that we fix upon a certain length, and call it a mile. By means of this mile we could measure any other length whatever. For by fractions or decimals we could express any part or parts of a mile whatsoever; we could add, subtract, multiply, or divide any number of miles or parts of a mile, etc. etc. But it is manifest that, although this could be done, great inconvenience would arise from the cumbrous nature of the operations. In treating, for instance, of fractional parts of a mile, it would be often very difficult to realise the length indicated. What idea would most people have of $\frac{1}{5283}$ of a mile? But if they were told that this length is very nearly indeed equal to a foot, they would form a very clear conception of the length. Hence, in measuring all magnitudes, the method of *subdivision* has been employed. Certain magnitudes have been fixed upon and named, and then these again have been divided and subdivided, and names have been given to the divisions, as convenience has best suggested.

Quantities expressed in this way by means of different subdivisions are called *compound quantities.* Thus, a sum of money, expressed in pounds, shillings, and pence, is a compound quantity. The names of the various subdivisions are generally called *denominations.*

2. *Accurate Standard or Unit.*

On proceeding to measure any magnitude or quantity, it is evident that it is of the utmost importance to come to an exact definition of some one fixed magnitude of the same kind, with which we may compare all such magnitudes. Such a fixed magnitude is called a *standard.* When this has been done, the standard can be subdivided, or multiples of it can be taken, as we please, and distinctive names can be given to the subdivisions or multiples.

The subdivisions which are employed in England in the coinage and weights and measures are, as might be expected, not founded upon one carefully prepared and philosophical system, but have gradually grown up during long centuries, having often been suggested by special convenience or local usage. The subject has of late received much attention, and the possibility and advantage of establishing a uniform *decimal system* of coinage, weights, and measures, have been discussed with considerable warmth.

Most of the foreign countries now use a decimal system of weights and measures called the "Metric System:" this will be treated of at length in a later lesson.

We proceed now to treat of the subdivisions of various concrete quantities which are now generally in use.

MEASURES OF TIME.

3. The time of the revolution of the earth in its orbit can be shown by the calculations of astronomical science to be an unvarying quantity, or, at any rate, to be subject to no appreciable variation for an immense number of centuries. Now, it is found that this time is 365·24224 (*i.e.*, *about* 365·25, or 365¼) *mean* solar days, a solar day being the interval which elapses between noon and noon—that is, between the times when the sun is successively highest in the heavens.*

The year is made to consist of 365 days—*i.e.*, *about* ¼ of a day less than the time of the revolution of the earth in its orbit. To every fourth year (*Bissextile* or *leap* year, as it is called) one day is added, and thus at the end of every four years the earth is again *very nearly* in the same part of its orbit as it was at the beginning of them. We say *very nearly*, because the earth actually revolves round the sun in 365·24224 days, which is less than 365¼ days by ·00776 of a day. This error *in excess* amounts to a day in about 128 years—*i.e.*, to very nearly 3 days in 4 centuries. Hence, to make our reckoning still more accurate, we *omit* 3 days in 4 centuries; and this is done by making the year which completes every century *not* a leap year, except such centuries as are divisible by 4. Thus A.D. 1700, 1800, and 1900 are not leap years, but A.D. 2000—*i.e.*, the year completing the twentieth century—is a leap year.

The establishment of the leap year is due to Julius Cæsar; that of the omission of the leap year three times in 400 years to Pope Gregory XIII., who, in the year A.D. 1582, when the error amounted to ten days, caused the ten days which followed October 4th to be omitted in the reckoning. October 5th consequently was called October 15th.

This latter system, the *New Style*, as it is called, was not adopted in England until A.D. 1752, when the difference between this and the old mode of reckoning amounted to about eleven days. The difference between the Old and New Style amounts at present to about twelve days. Thus any fixed days—Christmas Day and Lady Day, for instance—Old Style, would occur twelve days later than our present Christmas Day and Lady Day. Russia is now the only country in Europe which retains the Old Style.

Having, then, thus established a fixed invariable standard whereby to measure time, we are enabled to make any further subdivisions for convenience.

DIVISIONS OF TIME.

60 seconds	=	1 minute	written thus,	1 m., or 1′.
60 minutes	=	1 hour	,,	1 hr.
24 hours	=	1 day	,,	1 d.
7 days	=	1 week	,,	1 wk.
4 weeks	=	1 common month	,,	1 mo.
12 calendar months, or 365 days	=	1 year	,,	1 yr.

Any number of seconds are written either thus—35″, 23″, or 35 sec., 23 sec.

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* A solar day is not actually of unvarying duration, but is at some times in the year rather longer, and at others rather shorter, than its *average* length. It is this *average* length of the solar day which is called the *mean* solar day, and is divided into 24 hours.

It is better, however, in indicating *time*, to use the abbreviations sec. and min. for seconds and minutes, inasmuch as the same names and the marks ′ and ″ are used for certain divisions of the circle (Art. 18, lesson IX.).

The *Calendar* months into which the year is divided do not each contain the same number of days. They are as under :—

January . .	31 days.	July	31 days.
February . .	28 ,,	August . . .	31 ,,
Or 29 days in Leap Year.		September . .	30 ,,
March . . .	31 days.	October . . .	31 ,,
April . . .	30 ,,	November .	30 ,,
May	31 ,,	December . .	31 ,,
June	30 ,,		

The number of days in each month may easily be remembered by the following lines :—

Thirty days have September,
April, June, and November;
February twenty eight alone-
All the rest have thirty-one;
But leap year comes one year in four,
And February then has one day more.

MEASURES OF LENGTH.

4. Having determined, as above explained, an exact measure of *time*, we are enabled, curious as it may appear, to deduce from it a fixed and invariable measure of *length*. We might, of course, take any object—a piece of metal, say—and, giving to its length a particular name, thus obtain a means of measuring all other magnitudes. But this object, whatever it might be, and however carefully preserved, would be liable to be lost, to alteration from decay, variation of temperature, etc. It is therefore very desirable to have some invariable and independent means to which we can always have recourse, to give us an exactly accurate standard of length with which to compare all other lengths.

Now the interval of time called a second being invariable, it is found that a pendulum which, in the latitude of Greenwich, under certain conditions, oscillates in one second, is of a certain length. It is further proved, from mechanical and mathematical principles, that this length must always be exactly the same whenever the experiment is tried under exactly the same conditions. This accurate and scientific method, however, as might be expected, was not the way in which a measure of length was first determined. A certain measure called a *yard* having been established, and this yard divided into 36 equal parts, called inches, it was found that the length of the pendulum oscillating in one second of time at Greenwich contained 39·1393 such inches. We thus see that we have a means of recovering and correcting, at any time, the measure of the yard.

The actual standard yard was fixed, by Act of Parliament passed 1835, to be "the straight line or distance between the centre of the two points in the gold studs in the straight brass rod now in the custody of the Clerk of the House of Commons, whereon the words 'Standard Yard, 1760,' are engraved." The Act further states that in the latitude of London the pendulum vibrating seconds of mean time *in vacuo* at the level of the sea is 39·1393 inches.

This standard, however, was, in fact, destroyed in 1834, at the fire of the House of Commons, before the Act passed. The Astronomical Society, however, had carefully prepared a standard yard, which is calculated to differ from the old one by not more than $\frac{1}{140}$th of an inch. This imperial standard yard is a solid square bar of bronze, all measurements being taken when the bar is at the temperature of 62° Fahr.

We cannot here touch upon the ingenious and refined processes by which measurements are made when extreme accuracy is required, as, for instance, in determining a new standard length from the old one; or in finding to what amount of variation a given measured length is subject from unavoidable external causes.

SUBDIVISIONS OF LENGTH, OR LINEAR MEASURE.

5. The smallest measure is a barleycorn, or one-third of an inch; so called because, originally, the inch was obtained by placing together lengthwise three barleycorns taken from the centre of an ear of barley. Little more, however, than the name of this subdivision remains, measurements being generally conducted in decimal or fractional parts of an inch.

TABLE OF LINEAR MEASURE.

3	barleycorns	=1 inch	written	1 in.
12	inches	=1 foot	,,	1 ft.
3	feet	=1 yard	,,	1 yd.
5½	yards	=1 rod, perch, or pole	,,	1 r. or p.
40	rods, or 220 yards	=1 furlong	,,	1 fur.
8	furlongs, or 320 rods	=1 mile	,,	1 m.
3	miles	=1 league	,,	1 l.
60	*geographical* miles, or 62½ common miles	=1 degree*	,,	1 deg. or 1°.
360	degrees	=1 great circle of the globe.		

Other measures of length are sometimes used, having reference to special descriptions of magnitudes. For instance :—

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* A degree is in reality an angle; but, in measuring the earth's circumference, we give the name of degree to that portion of it which subtends an angle of one degree at the centre. See "Angular Measure," in lesson IX.

12 lines	= 1 inch.	$2\frac{1}{2}$ feet	= 1 military pace.
3 inches	= 1 palm.	5 ,,	= 1 geometrical pace.
4 ,,	= 1 hand.		
9 ,,	= 1 span.	6 ,,	= 1 fathom.
18 ,,	= 1 cubit.	240 yards	= 1 cable's length.

In measuring roads and land, a chain 22 yards or 4 rods long is used, called, from its inventor, *Gunter's chain*. It is divided into 100 links, each of which therefore contains $\frac{1}{25}$ of a rod, or 7·92 inches.

The following table shows the relation to the English statute mile of the various miles that have been or are in common use:—

	Statute Miles.
Kilometre (metric system)	0·621
Russian verst	0·663
Modern Roman mile.	0·925
Tuscan mile	1·027
Ancient Scottish mile	1·127
English geographical mile	1·153
Arabian mile	1·220
Ancient Irish mile	1·273
German short mile	3·897
German geographical mile	4·611
Prussian mile	4·680
Danish mile	4·684
Hungarian mile	5·178
Swiss mile	5·201
German long mile	5·753
Hanoverian mile	6·568
Swedish mile	6·648

CLOTH MEASURE.

In the measurement of cloth, linen, etc., the following lengths are sometimes used:—

$2\frac{1}{4}$ inches	= 1 nail	written	1 nl.
4 nails, or 9 inches	= 1 quarter (of a yard)	,,	1 qr.
3 quarters	= 1 Flemish ell	,,	1 Fl. e.
5 quarters	= 1 English ell	,,	1 E. e.
6 quarters	= 1 French ell	,,	1 Fr. e.

The last three measures are now very seldom used in England.

KEY TO EXERCISES.

EXERCISE 48.

1. 289, 529, 3249, 2025, 4624, 6241, 8649, 10609, 11449.

2, 3 and 4. Answers will be according to the numbers selected.

EXERCISE 49.

1. (*a*) 23. (*b*) 73. (*c*) 28. (*d*) 84.
(*e*) 167. (*f*) 9·8488. (*g*) ·9044. (*h*) 34·2.
(*i*) 1·781. (*j*) 3216. (*k*) $\frac{4}{7}$, $1\frac{1}{10}$, $\frac{4}{13}$, ·2941*.
(*l*) 4·1683.
2 (*a*) 19·104973174 (*b*) 1·41421356585. 3. 46.

EXERCISE 50.

1. 13. 2. 45. 3. 33. 4. 136.
5. 217. 6. 22·6. 7. 2·74. 8. ·623.
9. 3·335 approximately.† 10. 1·817 approximately.†
11. $3\frac{3}{8}$. 12. 78·65.

* Correct to 4 places.

† May be carried to 7 places as desired.

FRENCH.—VIII.

(*Continued from p. 50.*)

THE TWO FUTURES, SIMPLE AND ANTERIOR.

THE *future* of every verb in the French language ends in *-ai*, *-as*, *-a*, *-ons*, *-ez*, *-ont*.

This tense, in all the regular verbs, as also in the majority of the irregular verbs, is formed from the present of the infinitive by adding to it the endings of the present indicative of the verb *avoir* without any change in the first or in the second conjugation, but after suppressing *oi* in the third, and *e* in the fourth, as will be seen below:—

THE FUTURE SIMPLE OF THE REGULAR VERBS.

Je chanter *-ai* *shall* or *will sing*	finir *-ai* *finish*	recevr *-ai* *receive*	rendr *-ai*. *render*.
Tu parler *-as* *shalt* or *wilt speak*	chérir *-as* *cherish*	apercevr *-as* *perceive*	vendr *-as*. *sell*.
Il donner *-a* *shall* or *will give*	fournir *-a* *furnish*	percevr *-a* *collect*	tendr *-a*. *tend*.
Nous chercher *-ons* *shall* or *will seek*	punir *-ons* *punish*	concevr *-ons* *conceive*	entendr *-ons*. *hear*.
Vous porter *-ez* *shall* or *will carry*	saisir *-ez* *seize*	devr *-ez* *owe*	perdr *-ez*. *lose*.
Ils aimer *-ont* *shall* or *will love*	unir *-ont* *unite*	décevr *-ont* *deceive*	mordr *-ont*. *bite*.

The *future anterior* is merely the past participle of the leading verb conjugated with the future of one of the auxiliaries, *avoir*, *être*:—

J'aurai fini; je serai tombé.	*I shall have done; I shall have fallen.*

The student, when rendering English into French, should be careful to distinguish *will*, taken as an auxiliary, from the same word employed as a leading verb. In this latter case it is always equivalent to the verb *to wish*, or *to be willing*, and should not be rendered by the future of the verb, but by the present of *vouloir*:—

Ne voulez-vous pas lui écrire?	*Will you not (are you not willing to) write to him?*

MISCELLANEOUS EXAMPLES.

Quand parlerez-vous à ce monsieur?	*When will you speak to that gentleman?*
Vous fournira-t-il des provisions?	*Will he furnish you with provisions?*
Ils ne recevront pas leurs revenus.	*They will not receive their income.*
Ne vendrez-vous pas vos propriétés?	*Will you not sell your property?*
Que voulez-vous?	*What do you wish to have?*
Que veut lire votre frère?	*What will your brother read?*
Apporterez-vous des pommes?	*Will you bring apples?*
Nous amènerons nos enfants.	*We will bring our children.*
Vous apporterez des légumes.	*You will bring vegetables.*

VOCABULARY.

Abreuvoir, m.	*watering-place.*
Après-midi, f.	*afternoon.*
Avoine, f.	*oats.*
Cachet-er, 1,	*to seal.*
Champ, m.	*field.*
Château, m.	*country house*
Colporteur, m.	*pedlar, hawker.*
Donner à manger,	*to feed.*
Écurie, f.	*stable.*
Gel-er, 1,	*to freeze.*
Men-er, 1,	*to take to, to lead.*
Payer, 1,	*to pay.*
Récolt-er, 1,	*to gather in a crop, to harvest.*
Sem-er, 1,	*to sow.*
Se promen-er, 1, ref.	*to walk or ride.*
Voiture, f.	*a carriage.*

EXERCISE 51.

Translate into English :—

1. Mènerez-vous vos enfants à l'école ? 2. Je les mènerai à l'école et à l'église. 3. Le jardinier apportera-t-il des légumes au marché ? 4. Il y en apportera. 5. Où mènerez-vous ce cheval ? 6. Je le mènerai à l'écurie. 7. Lui donnerez-vous à manger ? 8. Je lui donnerai du foin et de l'avoine. 9. Lui donnerez-vous de l'eau ? 10. Je le mènerai à l'abreuvoir. 11. Paierez-vous ce que vous devez ? 12. Ne voulez-vous pas vous promener ? 13. Je me promènerai cette après-midi. 14. Vous promènerez-vous à pied ou à cheval ? 15. Je me promènerai à cheval, et ma sœur se promènera en voiture. 16. Marcherez-vous beaucoup dans votre voyage à Paris ? 17. Nous ne marcherons pas du tout. 18. N'appellerez-vous pas le colporteur ? 19. Je ne l'appellerai pas. 20. N'achèterez-vous pas ce château ? 21. Nous l'achèterons si nous pouvons. 22. Ne gèlera-t-il pas cette nuit ? 23. Je ne le crois pas, il fait trop chaud. 24. Ne sèmerez-vous pas tout le blé que vous récolterez ? 25. Je n'en sèmerai qu'une partie, je vendrai le reste. 26. Je cachetterai mes lettres et je les porterai à la poste.

EXERCISE 52.

Translate into French :—

1. Will not the gentleman call his children ? 2. He will call his children and his sister's. 3. Will you not bring your children ? 4. I cannot bring them. 5. Will you not take a ride this afternoon ? 6. We will ride in a carriage to-morrow. 7. Will you not buy my father's horses ? 8. I shall not buy them ; I have no money. 9. Will you not call the pedlar ? 10. I do not wish to call him ; I do not wish to buy anything. 11. Will you pay the tailor ? 12. I will pay him for my coat. 13. Will it not freeze to-morrow ? 14. It will freeze to-morrow ; it is very cold. 15. Will you not sow oats in this field ? 16. I will not sow oats ; I will sow wheat there. 17. Will you take your sister to school ? 18. I will take her there this afternoon. 19. Will you not take your son to market ? 20. I will not take him there. 21. Will not the gardener take his horse to the watering-place ? 22. He will take him there. 23. Will you give oats to your horse ? 24. I will give him hay. 25. Will you bring your son with you ? 26. I will bring him to-morrow. 27. Will he bring his horse ? 28. He will bring his horse and carriage. 29. Why do you carry that little child ? 30. He is too ill to (*pour*) walk. 31. Will your brother sell his property ? 32. He will only sell part of it. 33. Will not your servant carry the letter to the post-office ? 34. I will seal it and give it to him. 35. Will you feed my horse ? 36. I will feed him and give him some water.

THE TWO CONDITIONALS.

The conditional present is formed from the infinitive by adding to the latter the terminations *-ais*, *-ais*, *-ait*, *-ions*, *-iez*, *-aient*.

Every verb in the French language, regular and irregular, has in this tense the above terminations.

CONJUGATION OF THE CONDITIONAL PRESENT OF THE REGULAR VERBS.

Je chanter *-ais* *should* or *would sing*	finir *-ais* *finish*	recevr *-ais* *receive*	rendr *-ais.* *render.*
Tu parler *-ais* *shouldst* or *wouldst speak*	chérir *-ais* *cherish*	apercevr *-ais* *perceive*	vendr *-ais.* *sell.*
Il donner *-ait* *would* or *should give*	fournir *-ait* *furnish*	percevr *-ait* *collect*	tendr *-ait.* *tend.*
Nous chercher *-ions* *should* or *would seek*	punir *-ions* *punish*	concevr *-ions* *conceive*	entendr *-ions.* *hear.*
Vous porter *-iez* *would* or *should carry*	saisir *-iez* *seize*	devr *-iez* *owe*	perdr *-iez.* *lose.*
Ils aimer *-aient* *should* or *would love*	unir *-aient* *unite*	décevr *-aient* *deceive*	mordr *-aient.* *bite.*

The irregularities of the conditional appear not in the terminations, but in the *stem* of the verb. They are precisely the same as those of the future. These irregularities will be found in the preceding section, and need not be repeated here.

The conditional past is formed from the conditional present of one of the auxiliaries *avoir*, *être*, and the past participle of the leading verb :—

J'aurais écrit, je me serais flatté.	*I should have written, I should have flattered myself.*

The two futures and the two conditionals are not often used after the conjunction **si** (*if*). But if they are, the present and the imperfect of the indicative should be used in the other clause of the conditional sentence :—

S'il peut quitter son père, il viendra.	*If he can leave his father, he will come.*
Si j'étais à votre place, j'irais.	*If I were in your place, I would go.*

VOCABULARY.

Interromp-re, 4, ir. *to interrupt.*
Invit-er, 1, *to invite.*
Mett-re, 4, ir. *to put on.*
Mouill-er, 1, *to wet.*
Ôt-er, 1, *to take off.*
Peut-être, *perhaps.*
Volontiers, adv. *willingly.*
Voyage, m. *journey.*

EXERCISE 53.

Translate into English :—

1. Quel habit mettriez-vous, si vous sortiez ? 2. Je mettrais un habit vert. 3. N'ôteriez-vous pas vos bottes, si elles étaient mouillées ? 4. Je les ôterais. 5. Si vous aviez froid, ne seriez-vous pas malheureux ? 6. Je serais très-malheureux. 7. Votre petit garçon ne serait-il malade, s'il avait trop chaud ? 8. Il serait malade bien vite. 9. Égariez-vous mes livres, si vous les aviez ? 10. Je ne les

égarais jamais. 11. Ne mettriez-vous pas un chapeau noir, si vous sortiez? 12. Je mettrais un chapeau blanc; il est trop chaud à porter un chapeau noir. 13. Paieriez-vous cette visite, si je vous invitais? 14. Je viendrais avec beaucoup de plaisir. 15. Ne porteriez-vous pas mes livres, si vous sortiez? 16. Je les porterais certainement. 17. Ne lui parleriez-vous pas de votre affaire? 18. Je lui en parlerais. 19. Combien d'argent auriez-vous, si votre oncle était mort? 20. J'aurais dix mille francs. 21. Si j'étais à votre place, je lui paierais ce que je lui dois. 22. Si j'avais le temps, je porterais volontiers vos lettres à la poste.

EXERCISE 54.

Translate into French:—

1. Would you not read if you had time? 2. I would read two hours every day if I had time. 3. What coat would your brother put on if he went out? 4. He would put on a black coat. 5. Would you put on a black hat? 6. I would put on a straw hat (*chapeau de paille*) if it were warm. 7. Would you not dry your clothes if they were wet? 8. We would dry our clothes. 9. Would you not take off your coat? 10. I would take it off if it were wet. 11. Would you pay my father a visit if he invited you? 12. I would pay him a visit if he invited me. 13. Would you put on your boots if they were wet? 14. If they were wet I would not put them on. 15. How much money would you have if you lived in England? 16. We would have three thousand francs. 17. Would you read the book if I lent it you? 18. I would certainly read it. 19. If you were in my place would you write to him? 20. I would write to him every day. 21. If you were in his place, would you pay what he owes? 22. If I were in his place, I would pay it.

IRREGULAR VERBS: THEIR PRESENT INDICATIVE

There are in French, as in other languages, verbs which are called irregular, because their stem is altered instead of being invariable, as in the regular verbs; or because they have not the endings peculiar to their conjugation.

Many irregular verbs have tenses which are conjugated regularly.

The singular of the present of the indicative of the irregular verbs is almost always irregular.

PRESENT INDICATIVE OF THE IRREGULAR VERBS.

ALLER, 1, *to go.*	ENVOYER, 1, *to send.*	VENIR, 2, *to come.*
Je vais, *I go, do go,* or *am going.*	J'envoie, *I send, do send,* or *am sending,*	Je viens, *I come, do come,* or *am coming,*
Tu vas.	Tu envoies.	Tu viens.
Il va.	Il envoie.	Il vient.
Nous allons.	Nous envoyons.	Nous venons.
Vous allez.	Vous envoyez.	Vous venez.
Ils vont.	Ils envoient.	Ils viennent.

IDIOMS.

The expression *à la maison* is used for the English *at home, at his* or *her house,* &c.:—

Le chirurgien est-il à la maison?	*Is the surgeon at home?*
Mon frère est à la maison.	*My brother is at home.*

The preposition *chez,* placed before a noun or pronoun, answers to the English *at the house of, with* (meaning *at the residence of*), *among,* &c.:—

Chez moi, chez lui, chez elle.	*At my house, at his house, at her house.*
Chez nous, chez vous, chez eux, m. chez elles, f.	*At our house, at your house, at their house.*

That is, literally, *at the house of me, at the house of him,* &c.:—

Chez mon père, chez ma sœur.	*At my father's, at my sister's.*

The word *avec* answers to the English *with*:—

Le papier est sur la table avec vos plumes.	*The paper is on the table with your pens.*
Venez avec nous, ou avec lui.	*Come with us, or with him.*

The word *y* means *to it, at it, at that place, there.* It is generally placed before the verb, and refers always to something previously mentioned:—

Votre sœur est-elle chez vous?	*Is your sister at your house?*
Oui, Monsieur, elle y est.	*Yes, Sir, she is there.*

In French, an answer cannot, as in English, consist merely of an auxiliary or a verb preceded by a nominative pronoun, as, Do you come to my house to-day? *I do.* Have you books? *I have.* The sentence in French must be complete, as, *I go there; I have some.* The words *oui* or *non,* without a verb, would however suffice:—

Venez-vous chez moi aujourd'hui?	*Do you come to my house to-day?*
Oui, Monsieur, j'irai.	*Yes, Sir, I will.*
Avez-vous des livres chez vous?	*Have you books at home?*
Oui, Monsieur, nous en avons.	*Yes, Sir, we have.*

MISCELLANEOUS EXAMPLES.

Ou est le colonel?	*Where is the colonel?*
Il est chez son frere aine.	*He is at his eldest brother's*
N'est-il pas chez nous?	*Is he not at our house?*
Non, Monsieur, il n'y est pas.	*No, Sir, he is not.*
Madame votre mère est elle à la maison? *	*Is your mother at home?*
Non, Madame, elle n'y est pas.	*No, Madam, she is not.*
Allez-vous chez nous, ou chez lui?	*Do you go to our house, or to his house?*
N'est-il pas chez votre frère?	*Is he not at your brother's?*
Non, Monsieur, il est chez nous.	*No, Sir, he is at our house.*
N'envoyez-vous pas vos habits chez vos sœurs?	*Do you not send your clothes to your sisters'?*
Je les envoie chez elles.	*I send them to their house.*
N'allez-vous pas chez ce monsieur?	*Do you not go to that gentleman's?*
Je n'y vais pas, je n'ai pas le temps d'y aller aujourd'hui.	*I do not, I have not time to go there to-day.*

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* The French, in speaking to a person whom they respect, prefix the word *Monsieur, Madame,* or *Mademoiselle,* to the word representing their interlocutor's relations or friends.

VOCABULARY.

All-er, 1, ir. *to go.*
Ami, m. *friend.*
Associe, m. *partner.*
Capitaine, m. *captain.*
Cordonnier, m. *shoemaker.*
Demeur-er, 1, *to live, dwell.*
Gilet, m. *waistcoat.*
Hollandais, -e, *Dutch.*
Horloger, m. *watchmaker.*
Magasin, m *warehouse.*
Maison, f *house.*
Matin, m. *morning.*
Peintre, m. *painter*
Relieur, m. *bookbinder.*
Rest-er, 1, to *remain, live.*
Russe, *Russian.*
Ven-ir, 2, ir. *to come.*
Voisin, -e, *neighbour.*

EXERCISE 55.

Translate into English :—

1. Où allez-vous, mon ami? 2. Je vais chez Monsieur votre père; est-il à la maison? 3. Il y est ce matin. 4. D'où venez-vous? 5. Nous venons de chez vous et de chez votre sœur. 6. Qui est chez nous? 7. Mon voisin y est aujourd'hui. 8. Où avez-vous l'intention de porter ces livres. 9. J'ai l'intention de les porter chez le fils du médecin. 10. Avez-vous tort de rester chez vous? 11. Je n'ai pas tort de rester à la maison. 12. L'horloger a-t-il de bonnes montres chez lui? 13. Il n'a pas de montres chez lui, il en a dans son magasin. 14. Chez qui portez-vous vos livres? 15. Je les porte chez le relieur. 16. Allez-vous chez le capitaine hollandais? 17. Nous n'allons pas chez le capitaine hollandais, nous allons chez le major russe. 18. Est-il chez vous ou chez votre frère? 19. Il demeure chez nous. 20. Ne demeurons-nous pas chez votre tailleur? 21. Vous y demeurez. 22. D'où vient le peintre? 23. Il vient de chez son associé. 24. Où portez-vous mes souliers et mon gilet? 25. Je porte vos souliers chez le cordonnier et votre gilet chez le tailleur.

EXERCISE 56.

Translate into French :—

1. Where does your friend go? 2. He is going to your house or to your brother's. 3. Does he not intend to go to your partner's? 4. He intends to go there, but he has no time to-day. 5. What do you want to-day? 6. I want my waistcoat, which is at the tailor's. 7. Are your clothes at your house? 8. They are not there, they are at the tailor's. 9. Where do you live? 10. I live at my sister-in-law's. 11. Is your father at home? 12. No, he is not. 13. Where does your servant carry the wood? 14. He carries it to my house. 15. Does the gentleman who is with your father live at his house? 16. No, he lives with me. 17. Whence (*d'où*) comes the merchant? 18. He comes from his partner's house. 19. Has he two partners? 20. No, Sir, he has only one, who lives here. 21. Have you time to go to our house this morning? 22. We have time to go there. 23. We intend to go there and to speak to your sister. 24. Is she at your house? 25. She is at her (own) house. 26. Is your watch at the watchmaker's? 27. It is there. 28. Have you two gold watches? 29. I have only one gold watch. 30. Who intends to go to my father's this morning? 31. Nobody intends to go there.

INTERROGATIVE FORM OF PRESENT INDICATIVE; ARTICLE CONTRACTED WITH *À*.

In the *first* person singular of the present of the indicative of almost all those French verbs which in that person have only one syllable, the common interrogative form is not allowed. To render the verb interrogative the expression *est-ce que* is prefixed to the affirmative form :—

Est-ce que je vends du drap?	*Do I sell cloth?*
Est-ce que je joue souvent?	*Do I play often?*

The first person singular of the indicative of **avoir**, *to have;* **être**, *to be;* **aller**, *to go;* **pouvoir**, *to be able;* **devoir**, *to owe;* **savoir**, *to know*, etc., may, however, be conjugated interrogatively according to the general rules :—

Ai-je vos mouchoirs?	*Have I your handkerchiefs?*
Combien vous dois-je?	*How much do I owe you?*

The form *est-ce que* is always allowable, and sometimes preferable, when the *first* person singular of the present of the indicative of a verb has several syllables :—

Est-ce que je vous envoie des livres?	*Do I send you books?*
Est-ce que je commence à parler?	*Do I begin to speak?*

Est-ce que may, in familiar conversation, be used with all the persons of those tenses susceptible of being conjugated interrogatively :—**Qu'est-ce que vous lisez?** may be said instead of **Que lisez-vous?** *What do you read?*

INTERROGATIVE FORM OF THE INDICATIVE PRESENT OF

ALLER, *to go.*	ENVOYER, *to send.*	VENIR, *to come.*
Est-ce que je vais? *do I go*, or *am I going?*	Est-ce que j'envoie? *do I send*, or *am I sending?*	Est-ce que je viens? *do I come*, or *am I coming?*
Vas-tu?	Envoies-tu?	Viens-tu?
Va-t-il?	Envoie-t-il?	Vient-il?
Allons nous?	Envoyons-nous?	Venons nous?
Allez-vous?	Envoyez-vous?	Venez-vous?
Vont-ils?	Envoient-ils?	Viennent-ils?

The article *le*, preceded by the preposition *à*, is contracted into *au* before a noun masculine commencing with a consonant or an *h* aspirate; and into *aux* before a plural noun :—

Allez-vous au bal ou au marché?	*Do you go to the ball or the market?*

A l'église means *at* or *to church;* **à l'école**, *at* or *to school :—*

Nous allons à l'église et à l'école.	*We go to church and to school.*

Quelque part means *somewhere, anywhere;* **nulle part**, *nowhere :—*

Où est votre neveu, *or* Votre neveu où est-il?	*Where is your nephew?*
Il est quelque part.	*He is somewhere.*
Il n'est nulle part.	*He is nowhere.*

IDIOMATIC USE OF SOME VERBS; IMPERATIVE.

The verb *aller* is used in French in the same manner as the verb *to go* in English, to indicate a proximate future :—

Allez-vous écrire ce matin?	*Are you going to write this morning?*
Je vais ecrire mes lettres.	*I am going to write my letters.*

The verb *venir* is used idiomatically in French to indicate a past just elapsed. It requires in this signification the preposition *de* before another verb :—

Je viens d'écrire mes lettres.	*I have just written my letters.*
Nous venons de recevoir des lettres.	*We have just received letters.*

Aller trouver, *venir trouver*, are used in the sense of *to go to*, *to come to*, in connection with nouns or pronouns representing persons :—

Allez trouver le ferblantier.	*Go to the tinman.*
J'ai envie d'aller le trouver.	*I have a desire to go to him.*
Venez me trouver a dix heures.	*Come to me at ten o'clock.*

Aller chercher means *to go for*, *to go and fetch* :—

Allez chercher le médecin.	*Go and fetch the physician.*
Je vais chercher du sucre et du café.	*I am going for coffee and sugar.*

Envoyer chercher means *to send for*, *to send and fetch* :—

Envoyez chercher le marchand.	*Send for the merchant.*
J'envoie chercher des legumes.	*I send for vegetables.*

The first and second persons of the plural of the imperative are, with few exceptions, the same as the corresponding persons of the present of the indicative. The pronouns *nous*, *vous* are not used with the imperative.

PLURAL OF THE IMPERATIVE OF ALLER, ENVOYER, AND VENIR.

Allons, *let us go*	Envoyons, *let us send.*	Venons, *let us come.*
Allez, *go.*	Envoyez, *send.*	Venez, *come.*

IDIOMS.

Tous, m. *toutes*, f. followed by the article *les* and a plural noun, are used in French in the same sense as the word *every* in English :—

Votre frère vient tous les jours.	*Your brother comes every day.*
Vous allez à l'école tous les matins.	*You go to school every morning.*

Tout, m. *toute*, f. followed by *le* or *la* and the noun in the singular, are used for the English expression *the whole* coming before a noun: —

Il reste ici toute la journée.	*He remains here the whole day.*

A day of the week or of the month, pointed out as the time of an appointment or of an occurrence, is not preceded by a preposition in French :—

Venez lundi ou mardi.	*Come on Monday or Tuesday.*
Venez le quinze ou le seize avril.	*Come on the fifteenth or sixteenth of April.*

When the occurrence is a periodical or customary one, the article *le* is prefixed to the day of the week or the time of the day :—

Il vient nous trouver le lundi.	*He comes to us Mondays.*
Il va trouver votre père l'après-midi.	*He goes to your father in the afternoon.*

MISCELLANEOUS EXAMPLES.

Je vais parler à M. votre père.	*I am going to speak to your father.*
Nous venons de recevoir de l'argent.	*We have just received money.*
Que venez-vous de faire?	*What have you just done?*
Je viens de déchirer mon habit.	*I have just torn my coat.*
Votre frère va-t-il trouver son ami?	*Does your brother go to his friend?*
Il va le trouver tous les jours.	*He goes to him every day.*
Il vient me trouver tous les lundis.	*He comes to me every Monday.*
Allez-vous chercher de l'argent?	*Do you go and fetch money?*
Je n'en vais pas chercher.	*I do not.*
Envoyez-vous chercher des livres Arabes?	*Do you send for Arabic books?*
Allez-vous chez cette dame lundi?	*Do you go to that lady's house on Monday?*
J'ai l'intention d'y aller mardi.	*I intend to go there on Tuesday.*
J'y vais ordinairement le mercredi.	*I generally go there on Wednesdays.*
Il va à l'église le dimanche.	*He goes to church on Sundays.*

VOCABULARY.

Année, f. *year.*
Apprend-re, 4, ir. *to learn.*
Commenc-er, 1, *to commence.*
Compagne, f. *companion.*
Connaissances, f. *acquaintances.*
Demain, *to-morrow.*
Dimanche, m. *Sunday.*
Écossais, -e. *Scotch.*
Écri-re, 4, ir. *to write.*
Enseign-er, 1, *to teach*
Excepté, *except.*
Irlandais, -e, *Irish.*
Jeudi, m. *Thursday.*
Journée, f. *day.*
Lundi, m. *Monday.*
Malade, *sick.*
Mardi, m. *Tuesday.*
Mercredi, m. *Wednesday.*
Musique, f. *music.*
Prochain, -e, *next.*
Rest-er, 1, *to remain, to live.*
Samedi, m. *Saturday.*
Teinturier, m. *dyer.*
Vendredi, m. *Friday.*

EXERCISE 57.

Translate into English :—

1. Qu'allez-vous faire? 2. Je vais apprendre mes leçons. 3. N'allez-vous pas écrire à vos connaissances? 4. Je ne vais écrire à personne. 5. Qui vient de vous parler? 6. L'Irlandais vient de nous parler. 7. Quand l'Écossaise va-t-elle vous enseigner la musique? 8. Elle va me l'enseigner l'année prochaine. 9. Va-t-elle commencer mardi ou mercredi? 10. Elle ne va commencer ni mardi ni mercredi, elle a l'intention de commencer jeudi, si elle a le temps. 11. Votre compagne va-t-elle à l'église tous les dimanches? 12. Elle y va tous les dimanches et tous les mercredis. 13. Qui allez-vous trouver? 14. Je ne vais trouver personne. 15. N'avez-vous pas l'intention de venir me trouver demain? 16. J'ai l'intention d'aller trouver votre teinturier. 17. Envoyez-vous chercher le médecin? 18. Quand je suis malade, je l'envoie chercher. 19. Reste-t-il avec vous toute la journée? 20. Il ne reste chez moi que quelques minutes. 21. Allez-vous à l'école le matin? 22. J'y vais le matin et l'après-midi. 23. Y allez-vous tous les jours? 24. J'y vais tous les jours, excepté le lundi et le dimanche. 25. Le samedi je reste chez nous, et le dimanche je vais à l'église.

EXERCISE 58.

Translate into French :—

1. What is the Irishman going to do? 2. He is going to teach music. 3. Has he just commenced his work? 4. He has just commenced it. 5. Who has just written to you? 6. The dyer has just written to me. 7. Does your little boy go to church every day? 8. No, Sir, he goes to church on Sundays and he goes to school every day. 9. Do you send for the physician? 10. I send for him because my sister is sick. 11. Do you go to my physician or to yours? 12. I go to mine, yours is not at home. 13. Where is he? 14. He is at your father's or at your brother's. 15. Do you intend to send for the physician? 16. I intend to send for him. 17. Am I right to send for the Scotchman? 18. You are wrong to send for him. 19. Do you go to your father in the afternoon? 20. I go to him in the morning. 21. Does your brother go to your uncle's every Monday? 22. He goes there every Sunday. 23. Are you going to learn music? 24. My niece is going to learn it if she has time. 25. Am I going to read or to write? 26. You are going to read to-morrow. 27. Does he go to your house every day? 28. He comes to us every Wednesday. 29. At what hour? 30. At a quarter to nine. 31. Does he come early or late? 32. He comes at a quarter past nine. 33. What do you send for? 34. We send for wine, bread, butter, and cheese. 35. What do you go for? 36. We go for vegetables, meat, and sugar.

PLACE OF THE PRONOUNS.

The personal pronoun used as the direct object of the verb is in French placed before the verb, except in the second person singular or in the first and second persons plural of the imperative when used affirmatively :—

Il me voit, il l'aime.	*He sees me, he loves him.*
Il nous aime, il vous aime.	*He loves us, he loves you.*

The personal pronoun representing the indirect object of the verb, answering to the dative of the Latin and to the indirect object of the English with the preposition *to* expressed or understood, is also in French placed before the verb :—

Il me parle, il lui parle.	*He speaks to me, he speaks to him.*
Il nous donne une fleur.	*He gives us a flower.*
Il vous parle, il leur parle.	*He speaks to you, he speaks to them.*

The personal pronoun is placed *after* the verb in the imperative affirmative :—

Aimez-les, parlez-leur.	*Love them, speak to them.*

The words *en* and *y* follow the above rules :—

J'en parle, j'y pense.	*I speak of it, I think of it.*

The pronoun used as the indirect object of a verb (answering to the genitive or ablative of the Latin, and to the indirect object which in English is separated from the verb by a preposition other than *to* (*à*), which, of course, it follows) is in French always placed *after* the verb :—

Je parle de lui, d'elle, d'eux.	*I speak of him, of her, of them.*
Je reste avec vous et avec eux.	*I remain with you and with them.*

All pronouns used as objects of verbs must be repeated :—

Je les aime, je les respecte, je les honore.	*I love, respect, and honour them.*

KEY TO EXERCISES.

Ex. 41.—1. Who has told you that? 2. The barrister has told it to me. 3. Have you spoken to him of this affair? 4. I have not yet spoken to him about it. 5. Have you seen him lately? 6. I saw him a few days ago. 7. Did you not work yesterday? 8. We read and worked the whole day. 9. Have you not taken off your gloves and shoes? 10. I have not taken off my gloves, but I have taken off my hat. 11. Has not the tailor put on his hat? 12. Yes, Sir, he has put on his hat. 13. What have you said to that little boy? 14. I have said nothing to him. 15. Have you not told him that I am here? 16. I have not yet told him of it. 17. What have you studied this morning? 18. We have studied our lessons, and we have read our books. 19. Has the minister's gardener planted the pear-tree? 20. He planted it more than eight days ago. 21. Have you bought a black cloth coat? 22. I have bought one. 23. Have you worn it to-day? 24. I have not worn it yet. 25. We have put on our shoes and stockings this morning.

Ex. 42.—1. Avez-vous étudié aujourd'hui? 2. Nous n'avons pas le temps d'étudier; nous avons lu une page. 3. N'avez-vous pas écrit à mon frère? 4. Je ne lui ai pas encore écrit. 5. L'Allemand n'a-t-il pas écrit à ma mère? 6. Il ne lui a pas encore écrit. 7. Avez-vous dit à ma mere que j'ai pris ce livre? 8. Je n'ai pas encore vu votre mère. 9. Qu'avez-vous fait ce matin? 10. Nous n'avons rien fait. 11. Avez-vous ôté votre habit? 12. Je n'ai pas ôté mon habit, il fait trop froid. 13. Le libraire a-t-il écrit à votre frère? 14. Il lui a écrit il y a longtemps. 15. Lui a-t-il écrit il y a un mois? 16. Il lui a écrit il y a plus d'un an. 17. Avez-vous planté un poirier? 18. Nous en avons planté plusieurs. 19. Fait-il trop froid pour planter des arbres? 20. Il fait trop chaud. 21. Qu'est-ce que le jardinier a fait à votre petit garçon? 22. Il ne lui a rien fait. 23. Quelqu'un lui a-t-il fait quelque chose? (or *Lui a-t-on fait quelque chose?*) 24. On ne lui a rien fait. 25. A-t-il quelque chose? 26. Il n'a rien. 27. M. votre père a-t-il mis son chapeau noir? 28. Non, Monsieur, il n'a pas mis son chapeau noir. 29. Qu'a dit M. votre frère? (or *Qu'est-ce que M. votre frère a dit?*) 30. Il n'a rien dit. 31. Mlle. votre sœur vous a-t-elle dit cela? 32. Elle me l'a dit. 33. N'avez-vous pas travaillé hier? 34. Nous n'avons pas travaillé hier, nous n'avions rien à faire. 35. Votre petit garçon n'a pas étudié aujourd'hui.

Ex. 43.—1. Have you brought us our clothes? 2. We have not yet brought them. 3. Have you forgotten them? 4. We have not forgotten them, but we have not had time to bring them. 5. Why have you not called the merchants? 6. I have called them, but they have not heard me. 7. Have you heard that music? 8. I have heard it. 9. Have you not seen the pretty flowers which I have brought? 10. I have seen them; to whom have you given them? 11. I have not given them to anybody, I have kept them for you. 12. Have you examined those engravings well? 13. I have examined them well. 14. Have you bought them? 15. I have not bought them. 16. Have you not received your income? 17. I have not yet received it. 18. Has the servant broken these cups? 19. She has broken them. 20. Has she broken cups on purpose? 21. She has broken none on purpose. 22. Have you bought bound or sewed (*unbound, stitched*) books? 23. I have bought bound books. 24. Have you said those words to us? 25. We have said them to you, but you have forgotten them. 26. I have not forgotten your errand.

Ex. 44.—1. Avez-vous vu mes tasses? 2. Je ne les ai pas encore vues. 3. M'avez-vous apporté mes livres? 4. Je ne les ai pas oubliés; je les ai laissés chez mon frère. 5. Votre mère a-t-elle appelé vos sœurs? 6. Elle ne les a pas encore appelées. 7. La domestique vous a-t-elle dit cette nouvelle? 8. Elle m'a dit cette nouvelle. 9. Elle me l'a dite. 10. Avez-vous oublié ma commission? 11. Nous ne l'avons pas oubliée; nous avons oublié votre argent. 12. Où avez-vous laissé votre bourse? 13. Nous l'avons laissée chez le marchand. 14. Avez-vous acheté les belles gravures que j'ai vues chez votre libraire? 15. Je ne les ai pas vues. 16. Votre mère les a-t-elle achetées? 17. Elle a acheté des livres, mais elle n'a pas acheté de gravures. 18. Cette petite fille a-t-elle cassé mes tasses? 19. Elle les a cassées exprès. 20. Cette dame reçoit-elle ses revenus tous les mois? 21. Elle les reçoit tous les six mois. 22. La maison que vous avez achetée est-elle grande? 23. Je n'ai pas acheté de maison. 24. Avez-vous reçu une lettre de M. votre père hier? 25. J'ai reçu une lettre de lui, il y a quatre jours. 26. Avez-vous parlé à ces dames? 27. Je leur ai parlé. 28. Leur avez-vous donné des fleurs? 29. Je leur en ai donné. 30. Les livres que vous avez achetés, sont-ils reliés? 31. Non, Monsieur, ils sont brochés. 32. Avez-vous examiné cette maison? 33. Je ne l'ai pas examinée. 34. Votre frère en a examiné plusieurs.

Ex. 45.—1. Did the banker receive much money last week? 2. He received much. 3. As soon as you perceived your brother, did you not speak to him? 4. As soon as I perceived him, I spoke to him. 5. Have you worn your new clothes already? 6. I have not yet worn them. 7. When he gave you money yesterday, did you thank him? 8. I thanked him, and begged him to thank you. 9. Have you found your books? 10. I have not found them yet. 11. When you came to see us did you not finish your affairs with my father? 12. I finished them then, and paid him. 13. Have you not seen your eldest sister during your stay in Lyons? 14. I have not seen her. 15. Did you not seek to escape from your prison last year? 16. I have never tried to escape. 17. Have you sold your property? 18. I have not sold it. 19. What have you given to the soldier? 20. I have given him nothing. 21. During his stay at B., we gave him all that he wished.

Ex. 46.—1. Que reçûtes-vous la semaine dernière? 2. Nous reçûmes cinquante francs de votre ami, et vingt-cinq de votre frère. 3. Menâtes-vous votre fils à l'église hier? 4. Je ne l'y menai pas. 5. Que perdîtes-vous l'année dernière? 6. Nous perdîmes notre argent, nos habillements, et nos chevaux. 7. Les avez-vous cherchés? 8. Je les ai cherchés, mais je ne les ai pas trouvés. 9. Parla-t-on de votre frère hier? 10. On parla de lui et de vous. 11. Qu'est-ce que le médecin vous a donné? (or *Que vous a donné le médecin?*) 12. Il ne m'a rien donné. 13. Votre cousin a-t-il vendu toutes ses propriétés? 14. Il ne les a pas vendues, il les a données à sa sœur aînée. 15. Le voyageur vous a-t-il raconté ses aventures? 16. Il me les a racontées. 17. Cet homme a-t-il cherché à parler à votre père? 18. Il a cherché à lui parler. 19. Le professeur a-t-il parlé de votre frère pendant son séjour chez vous? 20. Il a parlé de lui. 21. Votre ami a-t-il porté son habit neuf? 22. Il ne l'a pas encore porté. 23. Avez-vous remercié votre frère? 24. Je l'ai remercié. 25. Qu'avez-vous donné à votre sœur aînée? 26. Je ne lui ai rien donné, je n'ai rien à lui donner. 27. Quand M. votre frère vous donna un livre l'année dernière, le remerciâtes-vous? 28. Je ne le remerciai pas.

Ex. 47.—1. Of whom were you speaking this morning when I found you? 2. My cousin was speaking of her brother, and I was speaking of mine. 3. Did you not like beef better than mutton formerly? 4. I used to like beef, but I never liked mutton. 5. Did you not (*use to*) sell many books when you lived in Paris? 6. I sold many, because I was a bookseller. 7. Has the bookseller sold many pencils this morning? 8. He has sold many pencils to-day. 9. Did you (*use to*) sell much parchment when you were a bookseller? 10. I sold almost none. 11. Did your brother (*use to*) wear a green coat when he lived in London? 12. He wore a brown coat and black slippers. 13. What were you seeking? 14. I was looking for my book. 15. How long had you lost it? 16. I had lost it since yesterday. 17. Have you found it again? 18. I had found it again, but I have lost it anew. 19. Did that baker use to furnish you with good bread? 20. He used to furnish us with excellent bread. 21. Did you often punish your scholars? 22. I used to punish them when they deserved it. 23. Where were you this morning when I was looking for you? 24. I was in my room. 25. I was finishing my exercise.

Ex. 48.—1. Qui était chez vous ce matin? 2. Mon ami G. y était, et il vous cherchait. 3. Avez-vous parlé à mon père hier? 4. Je lui parlais quand on m'apporta votre lettre. 5. M. votre père portait-il un chapeau blanc quand il demeurait à Londres? 6. Il portait un chapeau noir. 7. Chantiez-vous quand mon père est arrivé? 8. Non, je finissais mon thême. 9. Aviez-vous perdu votre crayon ce matin? 10. Je l'avais perdu, et je le cherchais quand vous m'avez parlé. 11. Vous aimiez la lecture; Mlle. votre sœur l'aimait-elle aussi? 12. Elle l'aimait aussi. 13. Quelle chanson chantiez-vous ce matin? 14. Je chantais une chanson italienne. 15. Avez-vous eu peur de me parler? 16. Je n'ai jamais eu peur de vous parler. 17. Avez-vous apporté mon livre? 18. Je ne l'ai pas apporté.

Ex. 49.—1. Did you not know where the musician was gone? 2. I knew that he was gone to Paris. 3. Had you not been told that your brother was dead? 4. I had been told that he was dangerously ill. 5. Did you not generally go out as soon as you had finished your lessons? 6. As soon as I had finished them, I used to be happy. 7. As soon as you had finished your lessons last evening, to whom did you talk? 8. As soon as I had finished them, I talked to your brother. 9. Had not that little girl a wish to sleep? 10. She had more wish to sleep than to study. 11. Where had you put your book when I asked you for it? 12. I had mislaid it. 13. I had forgotten it in the garden. 14. Why was your watch stopped? 15. Because I had forgotten to wind it up. 16. Had not the watchmaker wound it up? 17. He had forgotten to do it. 18. Had you not lost your purse? 19. I had lost it, but I have found it again. 20. Had your cousin left? 21. He had not left yet. 22. Was he out? 23. He was out with my mother.

Ex. 50.—1 N'aviez-vous pas eu l'intention de parler à mon frère? 2. J'avais eu l'intention de lui parler, mais il était parti. 3. Mlle. votre sœur sortit-elle hier au soir, aussitôt qu'elle eut lu son livre? 4. Elle sortit aussitôt qu'elle l'eut lu. 5. Vous avait-on dit que votre sœur était malade? 6. On m'avait dit qu'elle avait été dangereusement malade. 7. Saviez-vous ce que vous aviez fait de votre plume? 8. Je savais que je l'avais égarée. 9. Combien de vos livres avez-vous égarés? 10. J'en avais égaré cinq, mais mon frère les a retrouvés. 11. Où les aviez-vous laissés? 12. Je les avais laissés dans le jardin. 13. La montre de votre frère était-elle arrêtée? 14. Elle était arrêtée. 15. Pourquoi était-elle arrêtée? 16. Il avait oublié de la remonter. 17. N'avait-il pas perdu sa

clef? 18. Il ne l'avait pas perdue. 19. Le teinturier était-il parti? 20. Il n'était pas encore parti, il avait l'intention de partir à cinq heures. 21. Lui aviez-vous parlé, quand j'arrivai hier? 22. Je lui avais parlé. 23. Lui aviez-vous dit que ma sœur est ici? 24. Je le lui avais dit. 25. Est-il encore ici? 26. Non, il est parti; il a parti ce matin à six heures.

GEOGRAPHY.—VIII.

[*Continued from p. 6.*]

THE ASIATIC POSSESSIONS OF GREAT BRITAIN (*continued*).

THE INDIAN EMPIRE (*continued*).

Climate and Soil. — The monsoons produce a periodicity in the climate of India (see "Physical Geography," lesson III., Vol. I., p. 146), March to June being generally hot and dry, the rains brought by the south-west monsoon then continuing till October, and then temperate weather till February. The mean temperature at Madras is 84° F., at Calcutta and Bombay 82° F.; but in "the Hills," as at Simla in the Sub-Himálayas, at Ootacamund in the Nilgiris, and, in fact, over much of the elevated table-land, it is far less. The heaviest recorded rainfall in the world is that of Cherrá Poonee in the Cossya Hills of Assam, averaging 368 inches, and reaching 805 in the year, or 30 in one day; but in the north-west are areas almost rainless. Periodical droughts occur producing famines. Though there are sandy wastes in the plain of the Indus, much of the Deccan has a most fertile "black cotton-soil," and the floods of the Ganges and careful artificial irrigation maintain fertility elsewhere.

Mineral Productions.—Pure iron-ore is abundantly distributed; but the coal is seldom near, and contains much ash. Coal is chiefly worked round Ránigunge in Burdwan, 120 miles north of Calcutta. Salt is quarried in the Hála Mountains, and is obtained by evaporation on the coast. Saltpetre occurs as an efflorescence chiefly in Behar. Tin ore is abundant in Tenasserim. Gold and diamonds were formerly worked in the Deccan. The ruby mines of Burma are the richest in the world.

Vegetable Products.—About one-tenth of British India is under forest, yielding many valuable timbers, gums, and resins. The deodar, pines, oaks, and rhododendrons characterise the Himálayan region. Teak, occurring pre-eminently in Burma, sál, toon, and satinwood, among timber-trees; the cocoa-nut and other palms, especially near the coast; bamboos, the banyan, the india-rubber, the mulberry, upon which the silkworms feed; tea, wild in Assam; the curious pitcher-plants and orchids may be mentioned here.

Animals.—Insect life is very varied, the silk-worm and the lac insect being noteworthy. Scorpions and crocodiles abound, and poisonous snakes cause a large annual mortality. Jungle-fowl, peafowl, pheasants, flamingoes, storks, parrots, and vultures are characteristic birds; and the Kashmir goat, the zebu, yak, jackal, hyæna, tiger, lion, Indian elephant, numerous monkeys, and the susu, or dolphin, of the Indus and Ganges, characteristic mammals.

Population.—The empire is estimated to have a population of 257 millions, which would give an approximate density of 170 per square mile; but the Ganges valley has about 500 per square mile. This population belongs to many distinct races, speaks many languages, and professes many religions. The races have been grouped under five classes:—(i.) The Negrito "Hill tribes," such as the Bhíls of Bombay and the Santals of Bengal; (ii.) the Dravidians of the Deccan; (iii.) the Indo-Chinese of Assam and Burma; (iv.) the Aryan high-caste Hindus or Bráhmans; and (v.) the Mohammedan Arabs, Afghans, and Persians.

Languages.—There are said to be 106 languages in India. These fall under the five classes just mentioned:—(i.) Kolarian, spoken by Hill tribes; (ii.) Dravidian, including Telugu, spoken by more than 15 millions, Tamil by 10, Kanarese by 7, and Malayálim by 2½; (iii.) Tibeto-Burman or Mongolian, including Burmese and Manipuri; (iv.) Aryan, including Hindi, Bengali, spoken by 30 millions, and the mixed Urdu or Hindustani, the "lingua franca" of Northern India, spoken by over 60 millions; and (v.) Semitic, including Persian and Arabic.

INDUSTRIES—*Agriculture.*—Two-thirds of the population are dependent upon agriculture. Two, or even three, harvests are obtained in the year; but one-tenth of the area under cultivation has to be artificially irrigated. The chief crops are millet, especially in the drier parts within the tropics; wheat, both there and in the north; rice, especially in the Ganges plain and in Lower Burma, where it occupies 90 per cent. of the area cultivated; cotton, on the black soil of the Deccan; jute, opium, and indigo, mainly in Bengal; tea, particularly in Assam and Darjiling; coffee, cinchona, the sugar-cane, tobacco, oil-seeds, and spices.

Manufactures.—Hand-woven cotton goods and muslins, unsurpassed in texture and design, are now being superseded by cheaper Manchester fabrics. Silk-weaving is also declining. Embroidery, carpet-weaving, jewellery, damascening, carving, inlaying, and pottery are generally distributed arts. Steam cotton-mills in Bombay and jute-mills in Bengal now rival those of Britain.

Commerce.—Besides the internal trade of the bazaars, and an extensive frontier trade, especially with Nepál and Afghanistán, India has a large export trade with China, especially in opium and cotton, valued at £13,000,000. Nearly 55 per cent. of Indian foreign trade is with Great Britain, and 62 per cent. of the steam-tonnage passes through the Suez Canal. Of ports, Calcutta and Bombay have about 40 per cent. each, Madras 6, Rangoon 4, and Kurrachee 2 per cent. of the foreign trade. The chief imports are cotton fabrics (£24,500,000), precious metals, and sugar; the chief exports raw cotton (£13,000,000), opium (£11,000,000), oil-seeds, rice, wheat, jute, hides, tea, and indigo.

Inland Communication.—There are over 14,000 miles of railway in India. The chief lines are:—(i.) the *East Indian* (1,500 miles), from Calcutta to Delhi; (ii.) the *Great Indian Peninsula* (1,267 miles), from Bombay to Nagpur, Jubbulpore, Poona, and Raichur; (iii.) the *Madras* (528 miles), from Madras to Raichur and Ootacamund to Beypore; (iv.) the *Oudh and Rohilkhund* (672 miles), from Lucknow to Moradabad, Cawnpore, and Benares; (v.) the *Bombay, Baroda, and Central India*, from Bombay to Surat, Baroda, Ahmedabad, Ajmere, and Delhi; (vi.) the *Sind, Punjáb, and Delhi*, from Kurrachee to Hyderabad, Multán, Lahore, Amritsar, Umballa, Meerut, and Delhi, with a branch to the Bolan Pass; (vii.) the *Lahore and Peshawur* (273 miles); (viii.) the *Great Southern of India*, from Madras to Trichinopoly and Tinnevelly; and (ix.) a line from Rangoon to Promé. The numerous canals mostly serve, like the huge tanks, for irrigation; but the great rivers of the north and the Irrawaddy are much used for transit. There are over 27,000 miles of telegraph.

Government.—Since 1858 the government of India has been vested in the Crown, and in 1877 the Queen assumed the title "Kaisar-i-Hind" (Empress of India). Her representative is the Viceroy and Governor-General, who has an executive council of six, and a legislative council containing twelve additional members. Two-fifths of the Indian area are made up of a large number of native states, whose chiefs, excepting those of Nepál and Bhotan in the north, acknowledge the suzerainty of England. The remaining three-fifths are mainly divided into eight provinces—viz., Bengal or Lower Provinces, North-west Provinces and Oudh, Punjáb, Assam, Burma, Central Provinces, Bombay, and Madras.

Revenue, &c.—The revenue of the Government of India, derived mainly from the land-tax, opium, salt, and excise dues, amounts to about 70 millions sterling; the expenditure being about the same, including over 20 millions for railways, irrigation works, and roads, and about as much for the army. The public debt is nearly 167 millions. The army exceeds 200,000 men, two-thirds being natives.

Education and Religion.—There are five examining universities in India, with faculties in arts, law, medicine, and engineering—those of Calcutta, Madras, Bombay, Allahabad, and Lahore—and a complete system of schools and colleges, subsidised by Government. 73 per cent. of the population are Hindus, 21 per cent. Mohammedans; Buddhists, 1·5 per cent., are most numerous in Burma; Sikhs in the Punjáb; and Christians in the extreme south.

Divisions and Chief Cities.—BENGAL, 193,198 square miles, with a population of 69½ millions, the most populous province, under a Lieutenant-Governor and Council. **Calcutta** [766], on the River Hoogly, 100 miles from the sea, capital of India, 6,471 miles (21 days) from London by the Overland Route, *viâ* Paris, Mount Cenis, Brindisi, the Suez Canal, Aden, Bombay, the Great Indian Peninsula and East Indian Railways. It is defended by Fort William. Being in 88° 33′ E. long., time here is nearly six hours fast by Greenwich. *Patna* [170], on the Ganges, centre of opium, rice, and indigo trade.

NORTH-WESTERN PROVINCES AND OUDH, 11,236 square miles, with nearly 45 million inhabitants, under a Lieutenant-Governor and Council. **Allahabad** [148], at junction of Ganges and Jumna, and of railways from Punjáb, Bombay, and Calcutta, a sacred city of the Hindus. *Lucknow* [261], former capital of Oudh, defended against the mutineers in 1857. *Benares* [199], on the Ganges, sacred city. *Cawnpore* [151], the scene of the massacre by Nana Sahib in 1857. *Agra* [160], on the Jumna, former Mogul capital, celebrated for the Taj Mahal, a mausoleum.

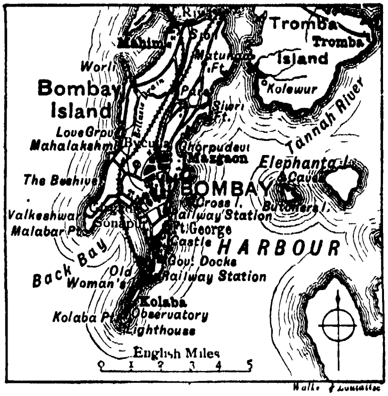
PUNJÁB, 142,449 square miles, with over 22 million inhabitants, under a Lieutenant-Governor. **Lahore** [149], a railway centre, the former Sikh capital. *Delhi* [173], on the Jumna, a former Mogul capital. *Amritsar* [151], manufacturing shawls. *Simla*, 7,000 feet above sea-level, the residence of the supreme government in the hot season. *Peshawur*, frontier station at mouth of Khyber Pass.

ASSAM, 46,341 square miles, with nearly 5 million inhabitants, under a Chief Commissioner. **Sylhet** [14], tea-district.

BURMA, consisting of Lower, formerly British, Burma, 87,220 square miles, with 3¾ million inhabitants; and Upper Burma, annexed in 1886, with an area estimated at 200,000 square miles, inclusive of the Shan States, and a population of 4 millions, under a Chief Commissioner. **Rangoon** [134], on the Irrawaddy, 8,025 miles from London, *viâ* Suez; and *Moulmein*, at the mouth of the Salween, important ports. *Mandalay*, the former Burmese capital. *Bhamo*, limit of steam-navigation on the Irrawaddy, 900 miles from its mouth.

CENTRAL PROVINCES, 113,279 square miles, with 11½ million inhabitants, under a Chief Commissioner. **Nagpur** [98], once an important Mahratta town.

BOMBAY, 197,875 square miles, with over 23 million inhabitants, under a Governor, Council, and Legislative Council, was formerly a Presidency.



BOMBAY HARBOUR.

Bombay [773], on an island, has the largest and safest harbour in India. It is 5,221 miles, or 19 days, from London by the Overland Route. Its trade is largely in the hands of Parsees. *Poona* [129], east of the Ghats, has a cool dry climate. *Surat*, at the mouth of the Tapti, has cotton trade. *Kurrachee*, in Sind, exporting wheat from the Punjáb, is the nearest Indian port to England, though transit is not yet rapid.

MADRAS, 141,000 square miles, with 31 million inhabitants, under a Governor, Council, and Legislative Council, was formerly a Presidency. **Madras** [405], with an artificial harbour, defended by Fort St. George, is 5,920 miles, or 21 days, from London by the Overland Route. The *Laccadive Islands* belong to this province.

BERAR, 17,711 square miles, with over 2½ million inhabitants; AJMIR, in Rajputana; COORG, S.W. of Mysore; and the penal settlements of *Port Blair, South Andaman* (one of a group of islands with Negrito aborigines), and the *Nicobar Islands* (Malayo-Burmese) are administered directly under the Governor-General.

Of the independent northern states, BHOTAN and NEPÁL, the latter (54,000 square miles), the country of the Gurkas, capital Katmandu, commands the chief Himálayan passes.

KASHMÎR, 79,784 square miles, with 1½ million inhabitants, under a Maharajah, with a British Resident, also commands passes. It produces shawls and attar of rose. **Srinagar**, on the Jhelum.

Of the SIKH STATES, south of the Sutlej, the chief is PUTTIALA.

RAJPUTANA, 129,750 square miles, with 10¼ million inhabitants, includes 18 tributary principalities.

BARODA, 8,570 square miles, with 2 million inhabitants, under the Gaekwar, includes most of Gujerat and the Kattiwar peninsula.

The CENTRAL INDIAN AGENCY, 75,079 square miles, with 9¼ million inhabitants, includes numerous states, of which the chief are GWALIOR, under Maharajah Sindhia, and INDORE under Maharajah Holkar.

HYDERABAD, 81,807 square miles, with nearly 10 million inhabitants, the largest native state, a fertile plateau, is the Dominion of the Nizam. **Hyderabad** [355] is near the centre. Near it is *Golconda*, once celebrated for diamond mines.

MYSORE, 24,723 square miles, with 4 million people, contains the towns of **Mysore**, *Bangalore* [155], and *Seringapatam*.

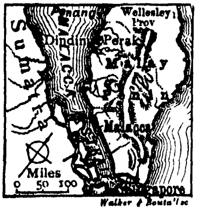
COCHIN and TRAVANCORE are small states in the south-west of the Deccan.

CEYLON

This island, taken from the Dutch in 1795, is about 60 miles south-east of India, between 5° 53′ and 9° 51′ N. lat., and between 79° 42′ and 81° 55′ E. long., 266 miles from north to south, 140 from east to west, and about 24,702 square miles in area, or half the size of England. It consists of a belt of low land encircling a plateau of more than 2,000 feet high, rising in the south to Adam's Peak, 7,420 feet, and Pedrotallagalla, 8,280 feet. This gives the interior a cooler climate than southern India. The island is well watered, and the River Mahavilla Gunga, flowing north-eastward, is 200 miles long. The soil is fertile, one-fifth of the island is cultivated, agriculture being the chief industry; and the chief crops are rice in the lower parts, cocoa-nuts, coffee, tea, and cinnamon. The island is rich in gems—sapphires and cat's-eyes occurring—in addition to the pearls of the Gulf of Manaar; and gold, silver, ivory, and tortoiseshell work are important native industries. The exports are coffee, tea, cinnamon, cacao, vanilla, india-rubber, and cocoa-nut oil. Wild elephants are numerous. The population of 2,825,000 consists mainly of Buddhists, speaking Cingalese. Hindus, speaking Tamil, number 687,000, mainly in the north. Ceylon is a "Crown colony," being administered by a Governor, Council, and Legislative Council. **Colombo**, the capital, on the west coast, is 5,200 miles, or 20 days, from London, and has a small harbour. Colombo time is 6 hours 20 minutes fast by Greenwich. *Galle*, or *Point de Galle*, at the south-west, has a good harbour, and is a regular calling-place for steamers. *Trincomali*, on the north-east, has a good harbour. *Kandy*; in the interior, was the native capital. The MALDIVE ARCHIPELAGO, to the S.W., are under a tributary Sultan.

THE STRAITS SETTLEMENTS.

These, consisting of Singapore, Malacca, Penang, Province Wellesley, the Dindings, and the Keeling Islands, are situated, with the exception of the last-named, in the Straits of Malacca between the Malay Peninsula and Sumatra. The total area is about 1,400 square miles, and the population about 475,000, of whom half are Chinese, the other half With a fertile soil, uniform tempera- 0° F., and high rainfall, gutta-percha, india-rubber, gambier, pepper, tapioca, sugar, coffee, and canes are among the chief vegetable products. Tin is also exported. The Straits Settlements are a Crown colony, under a Governor and Executive and Legislative Councils.



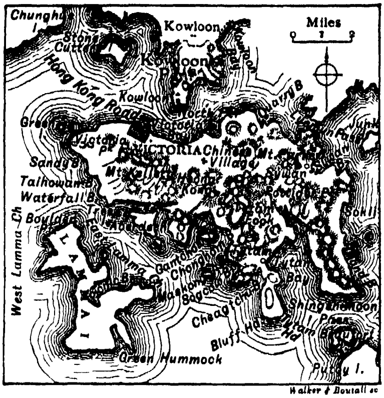
THE STRAITS SETTLEMENTS.

SINGAPORE is an island, 27 miles long and 14 broad, at the south end of the Malay Peninsula, its area being 206 square miles and its population 155,000. It was purchased in 1819. The town of **Singapore**, the capital, on the south-east side, is in lat. 1° 16′ N., long. 103° 53′ E.; is a free port with excellent docks and harbours, and a large trade, being in the most direct route to China and Japan, and also in that from India to Australia. Transit from London, 28 days. MALACCA, chief town **Malacca**, captured from the Dutch in 1795, has an area of 659 square miles and a population of 99,000. PENANG, officially PRINCE OF WALES ISLAND, chief town **Georgetown**, off the coast of Province Wellesley, has an area of 107 miles and a population of 91,000. PROVINCE WELLESLEY has an area of 270 square miles and a population of 97,000, and is engaged in sugar-growing. The DINDINGS, formerly belonging to Perak, have a fine natural harbour, a productive soil, and a population of over 2,000. Ebony, turtles, and tin are obtained.

The COCOS or KEELING ISLANDS, coral islands about 12° N. lat. and 96° E. long., are under the Straits Settlement Government. The native states of SUNGEI UJONG, SELANGOR, and PERAK, between Malacca and Wellesley, are under British protection. They produce tin.

HONG-KONG.

This island, taken from the Chinese in 1841, is at the mouth of the Canton River, in 22° N. lat., and 114° E. long. With KOWLOON, an adjacent peninsula, ceded in 1860, this Crown colony has an area of 32 square miles and a population of 180,000, 6 per cent. of whom are Europeans. It is an important naval station, and, being a free port with good docks and fortified, is a great trade-centre, especially in opium, sugar, flour, oil, ivory, cotton, tea, rice, and silk, its trade being estimated at over 20 millons sterling per annum. The climate is hot and wet. It is a Crown colony. Capital, **Victoria** [40]. Transit from London, 35 days.



HONG-KONG

PORT HAMILTON, an island off the south coast of Korea, was acquired, as a coaling station, in 1885.

LABUAN, an island six miles off the north-west coast of Borneo, in 5° N. lat. and 115° E. long., has an area of 31 square miles and 6,300 inhabitants. It has valuable coal-mines, a good harbour, and exports gutta-percha, india-rubber, edible birds'-nests,* bêche-de-mer* ("trepang" or "sea-cucumber"), bees'-wax, and sago, mainly to Singapore. It is a Crown colony.

SABA, or BRITISH NORTH BORNEO, a territory of 31,000 square miles, in the north-east of Borneo, with 600 miles of coast and many harbours, and a population of 150,000, was ceded to a company in 1877, chartered as the British North Borneo Company in 1881. Among the animals are the orang, elephant, rhinoceros, and crocodile. The soil is fertile, yielding magnificent timbers, sago, gutta-percha, camphor, spices, and the products mentioned under Labuan. The administration is in the hands of a Governor and Council. Capital, **Sandakan**.

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* These are respectively the glutinous bracket made by a swift from its saliva to support its nest, and a class of animals (*Holothuria*) allied to star-fish; both used as food by the Chinese.

SHORTHAND.—VIII.

[*Continued from page* 65.]

PRINCIPAL REPORTING GRAMMALOGUES.

ARRANGED PHONETICALLY

CONSONANTS.

1 happy, 2 up, 3 put
1 happen, 2 upon
1 happened
3 principle, principal
1 particular, 2 opportunity

1 by, 2 be, 3 to be
2 above
2 been
2 able, 3 belief, believe
2 build-ing, able to
1 liberty, 2 member, remember-ed, 3 number-ed

1 at, 2 it, 3 out
3 itself
1 at all, 2 tell, 3 till
2 told, till it
2 truth
1 tried, 2 toward
3 out of

1 had, 2 do, 3 different-ence
2 did
2 advantage, 3 difficult
2 done, 3 down
1 had not, do not, don't, 2 did not
1 Dr, 2 dear, 3 during

1 much, 2 which, 3 each
2 which have
1 child
2 chair, 3 cheer

1 large
3 religious
2 general-ly, 3 religion
1 gentleman, 2 gentlemen
1 larger
2 generation

1 has, as, 2 his, is
2 so, us, 3 see, use *(noun)*
1 as is (his, *or* has), has his, 2 is as, (*or* his), his is
2 first
2 special-ly, 3 speak
2 spirit
2 strength
1 Scripture; 2 secret
1 signify-ied, significant-ance
2 several, Saviour
1 sent, 2 scent; 2 send
2 somewhat

2 was, 3 whose, use *(verb)*

2 shall, shalt, 3 wish
3 sure
1 short

2 usual-ly; 2 pleasure

1 me, my, 2 him, may
1 might, met, 2 meet-ing
1 myself, 2 himself
1 most
1 important-ance, 2 improve-ed -ment
1 impossible, 2 improvements
2 may not, amount
1 more, 2 Mr, mere

1 can, 2 come
1 quite, 2 could
1 because
1 cannot, 2 account
1 call, 2 equal-ly
1 called, 2 cold, equalled
1 Christian, Christianity, 2 care
1 according to, cart, 2 cared

1 go, ago, 2 give-n
1 God, 2 good
2 glory, glorify-ied
2 gold
1 guard, 2 great

1 half, 2 if
1 after, 2 if it
1 often, 2 Phonography
2 for
2 from

2 have
2 heaven
1 over, 2 ever-y
2 very, 3 however
3 evil

1 thank, 2 think, 3 youth
1 thought
3 through
2 third

1 though, thy, 2 them, they
1 that, 2 without
1 those, thyself, 2 this, 3 thus, these
2 themselves
3 within
2 other
2 there, their, they are
3 therefore

1 in, any, 2 no, know, 3 own
1 not, 2 nature
1 hand, 2 under
1 information, 2 nation
1 influence
2 opinion
1 nor, 2 near

1 language, owing, 2 thing, 3 young

2 Lord
1 light, 2 let

2 are, 3 our, hour
1 or, 2 your, 3 year
1 art
1 yard, 2 word

2 we, way, away
wait, weight
2 one
1 want, 2 went, won't
2 will, well

2 whether, 3 whither
1 while

2 ye; 2 yet
2 yes

1 high
2 holy
2 house

VOWELS.

DOTS. a, an, . the, ah! . aye, eh

DASHES. of, on, and

all, O, oh! owe, awe, ought

to, but, should

two, too, he, who

When *he* and *did* follow each other, vocalize *did*

DIPHTHONGS.

I, eye, ay, how, why,

with, when, what, would,

beyond, you.

In Phraseography *on, and* (written upward), *but*, are used only initially, and medial is — or |

The figures denote the position in which the words are written.

156. *I* may be abbreviated by writing only the first stroke, when it will join easily to the consonant. (See *I am, I will*). Most of these phrases may be vocalized; thus, *I do,* *as well as,* etc. The first word in a phrase must occupy its own position; *can be,* *of your,* *you can,* *could not be;* but a logogram may be SLIGHTLY raised, or lowered, to suit the position of a following one; thus, *I had,* *I had not,* *I did not.*

157. Stops should be written in the usual way, except the Period, for which a small cross is used; thus, , ; : × The Hyphen is written thus, *well-spoken:* the Dash thus,

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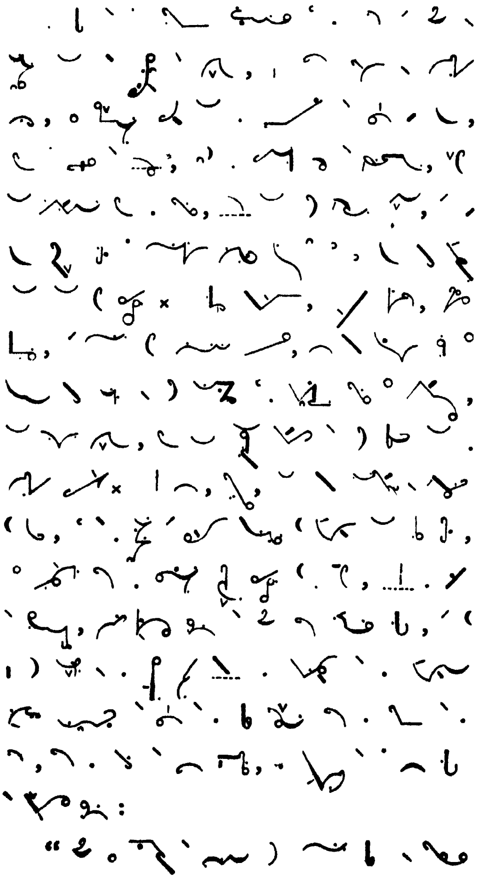
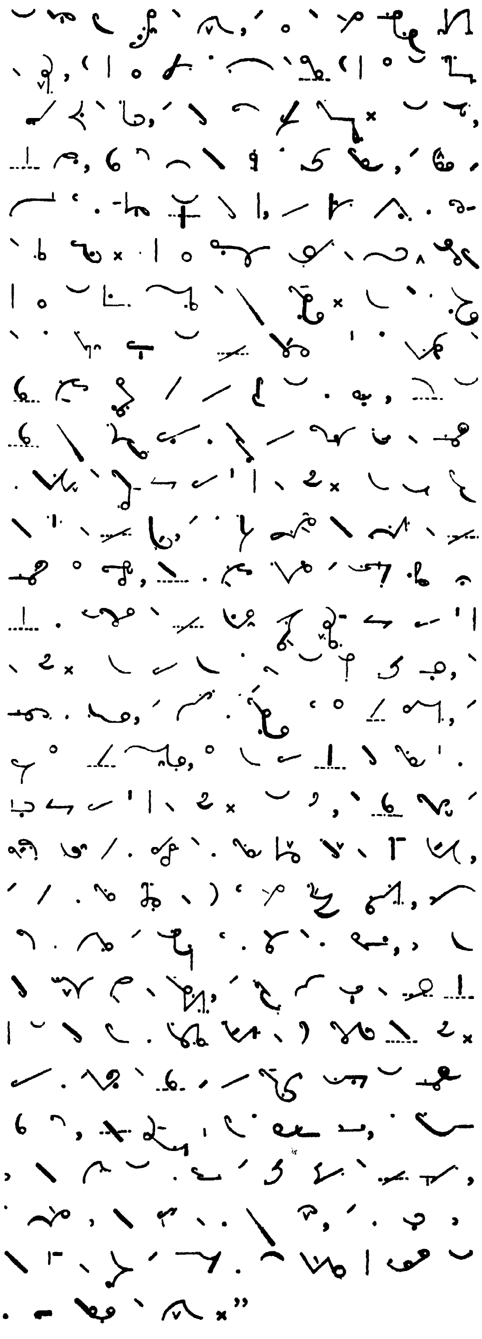
158.—ADVANTAGES OF SHORTHAND.





KEY.—The advantage of a practical acquaintance with the art of shorthand to individuals in all situations of life, but more particularly to literary men, is strikingly shown in the career of some who have, for a course of years, used the "winged words" of stenography, either in reporting for the press, or in their ordinary writing, and who have thereby attained a mental elevation far beyond what would have been possible in any other circumstances. EDMUND BURKE, Judge TALFOURD, CHARLES DICKENS, and many other eminent writers, may be fairly considered as having been indebted to their engagements with the periodical press as reporters in early life for no inconsiderable portion of their distinction in the literary world. It may, perhaps, not be inappropriate to observe that Phonography, with all the intellectual and social benefits that follow in its train, has resulted from the seemingly trifling circumstance that the author, at the age of seventeen, learned Taylor's system of shorthand from Harding's edition, and that he was incited to the study chiefly by the perusal of the following eloquent enumeration of some of the advantages arising from the practice of the art, from the pen of Mr. Gawtress, the publisher of an improved edition of Byrom's system :—

"Shorthand is capable of imparting so many advantages to persons in almost every situation of life, and is of such extensive utility to society, that it is justly a matter of surprise that it has not attracted a greater share of attention, and been more generally practised. In England, at least, this art may be considered a National Blessing, and thousands who look with the utmost indifference upon it are daily reaping the fruits of its cultivation. It is scarcely necessary to mention how indispensable it is in taking minutes of public proceedings. If all the feelings of a patriot glow in our bosoms on a perusal of those eloquent speeches which are delivered in the Senate, or in those public assemblies where the people are frequently convened to exercise the birthright of Britons—we owe it to shorthand. If new fervour be added to our devotion, and an additional stimulus be imparted to our exertions as Christians, by the eloquent appeals and encouraging statements made at the anniversaries of our various religious societies—we owe it to shorthand. If we have an opportunity, in interesting judicial cases, of examining the evidence, and learning the proceedings with as much certainty, and nearly as much minuteness, as if we had been present on the occasion—we owe it to shorthand. In short, all those brilliant and spirit-stirring effusions which the circumstances of the present time combine to draw forth, and which the press transmits to us with such astonishing celerity, warm from the lips and instinct with the soul of the speaker, would have been entirely lost to posterity, and comparatively little known to ourselves, had it not been for the facilities afforded to their preservation by shorthand. Were the operations of those who are professionally engaged in exercising this art to be suspended but for a single week, a blank would be left in the political and judicial history of our country, an impulse would be wanting to the public mind, and the nation would be taught to feel and acknowledge the important purposes it answers in the great business of life."

CONCLUSION.

159. Having at length conducted the student through a complete course of Phonography, under the personal guidance of the founder of the system, we propose to close our lessons with a brief sketch of phonographic literature, which will show the learner the abundant means he has at hand of pursuing, with the least possible expenditure of time and labour, the study of the art in which he should now be well grounded.

160. At the outset it is worthy of observation that Phonography is the only system of shorthand which has ever yet achieved so large a literature. Every other system begins and ends with the one lesson-book which explains it to the world. It is true that the Bible was printed in Rich's system, from engraved plates, in 1689, and an abridged Prayer Book was lithographed by Lewis, the stenographer; but these two books, though the very best, do not make a library. The reason that no other system than Phonography has given to the world a shorthand literature, is that in no other system of shorthand is there the same definiteness and simplicity of principle, the same certainty as to the meaning of the written character, the same general legibility utterly independent of the context. The Bible in Phonography is, to the practised student, as easy to read as the Bible in ordinary type. One phonographer can read another phonographer's writing, provided such writing be not slovenly and imperfect, as easily as he can read his own, and he can read lithographed Phonography as easily as he can read print.

161. We now proceed to our short sketch. Phonographic literature may be conveniently divided into: 1. Educational 2. Periodical, 3. Bibliothecal, 4. Recommendatory and Eulogistic.

162. In the Educational division we have first of all three works which lead the student up to the point at which we leave him—the "Phonographic Teacher," the "Phonographic Reader," and the "Manual of Phonography." These three

books contain all that is necessary to induct the learner into a knowledge of the art as it is used in correspondence and business, and for making notes and memoranda. For the actual work of professional reporting, where greater speed and consequently greater brevity are requisite. there is, as will be seen directly, another set of books which, while utilising all that has gone before, develop the system almost indefinitely, rendering it possible to follow with ease the most rapid speaker. While grounding the student in Phonography proper, however, as distinct from the Reporting branch of the art, the three works we have mentioned are not the only ones belonging to this period of study There is a valuable little volume, upon which great labour must have been expended, entitled "A Phonetic Shorthand Dictionary of the English Language" It holds to Phonography the same relation which a dictionary holds to a language In it are to be found the easiest and most legible methods of writing the longest and most awkward words. None but those who in the earlier stages of their learning have availed themselves of this useful little volume know the difficulties it smooths over, or the ease and clearness it imparts to their writing At this period, too, certain of the shorthand magazines give useful help to the student, but of these we shall speak presently.

163. We now come on to the Educational literature of the "Reporting Style"—that is, the style which is indispensable to the intending reporter. First of all there is the "Phonographic Reporter, or Reporter's Companion," which is to reporters' Phonography what the "Manual" is to ordinary Phonography. It lays down principles for shortening the system, gives additional grammalogues, leads the learner further into the labour-saving paths of phraseography, and closes with a number of admirably arranged exercises. As with the "Manual" so with the "Reporter's Companion:" it contains all that the student absolutely requires to know. But in the same manner as the "Dictionary" supplements the "Manual," so are there other works which supplement the "Reporter," and lighten the labour of practice. One of these is the "Phonographic Phrase Book," which contains, together with a preliminary essay on the principles of phraseography, somewhere between three and four thousand useful phrases, written in such a way as to combine the maximum of ease with the maximum of clearness.

164. Turning to the Periodical literature of Phonography, we find that the system boasts a number of magazines, some of which appear weekly and some monthly. The majority of them are replete with articles which combine instruction with entertainment. Some of them contain papers which solve the student's difficulties, others give him valuable information upon points likely to be of special value to him in his profession. Others again travel out of the technical into the general, and win his suffrages by their literary merit alone. It is too often forgotten that in learning a language the first thing to do is to learn to read it fluently; and it is for this purpose that these phonographic magazines are so helpful to the student. They accustom him to read

165. In the Bibliothecal division we have a proof at once of the capabilities of Phonography and the universality of its use among those who write shorthand Nothing but a very large constituency of phonographers could repay the enterprise which has brought into existence so many handsome library volumes, all beautifully printed in shorthand—some in plain Phonography, and some in Reporting. First, we have an edition of the New Testament. Then we have, similarly bound and got up, a Book of Common Prayer, and following these some twenty books printed in the Corresponding and Reporting Styles of Phonography. A list of all these books it is, of course, impossible to give, but a catalogue may be obtained on application at the Phonetic Depôt.

166. The fourth department of phonographic literature must be dismissed in a sentence or two. It consists mainly of tracts and pamphlets illustrative of the advantages of Phonography, and pointing out the thousand and one ways in which it may be made subservient to the daily necessities even of those who can conceive of no present use for it. Some of these tracts are reprints of publications or speeches from America and the colonies; others have their origin nearer home. Others, again, are from the pen of the inventor of Phonography, Mr. Isaac Pitman, who, cheered by the consciousness that he has benefited millions, descends into the vale of years accompanied by the gratitude of thousands whose labours he has lightened. These millions, as they read their morning paper, little dream that they are indebted to a still living benefactor for the accuracy, the speed, and to some extent the cheapness, with which they are furnished with the report of last night's debate or public meeting. When we mention that all the educational works we have enumerated have been produced under Mr. Pitman' own superintendence, we shall have thrown an additional light upon the Herculean task which has been undertaken and accomplished by him, under whose guidance our shorthand students have been piloted so pleasantly.

To add that full particulars concerning all the works to which we have referred in this brief notice, may be obtained by application to the Phonetic Institute, Bath, or to Messrs. Isaac Pitman and Sons, 1, Amen Corner, Paternoster Row, E.C., is to close our task, and with it our lessons in "Shorthand."

MUSIC.—IX.

[*Continued from p.* 97.]

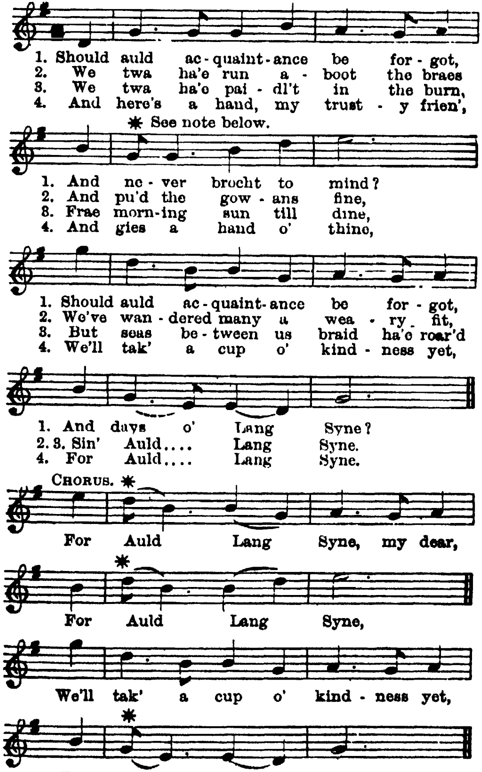
RHYTHM (*continued*).

(STAFF NOTATION.)

Ex. 74.—Illustration of $\mathbf{d}$ to $\mathbf{l}_1$ and $\mathbf{l}$ to $\mathbf{d}^1$.

AULD LANG SYNE.

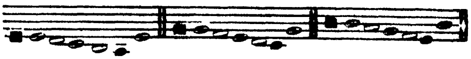
Written with doh as G; but can be sung in any suitable lower pitch for doh. Four-pulse measure.


1. Should auld ac-quaint-ance be for-got,
2. We twa ha'e run a-boot the braes
3. We twa ha'e pai-dl't in the burn,
4. And here's a hand, my trust-y frien',
✱ See note below.
1. And ne-ver brocht to mind?
2. And pu'd the gow-ans fine,
3. Frae morn-ing sun till dine,
4. And gies a hand o' thine,
1. Should auld ac-quaint-ance be for-got,
2. We've wan-dered many a wea-ry fit,
3. But seas be-tween us braid ha'e roar'd
4. We'll tak' a cup o' kind-ness yet,
1. And days o' Lang Syne?
2. 3. Sin' Auld.... Lang Syne.
4. For Auld.... Lang Syne.
CHORUS. ✱
For Auld Lang Syne, my dear,
✱
For Auld Lang Syne,
We'll tak' a cup o' kind-ness yet,
✱
For Auld Lang Syne.

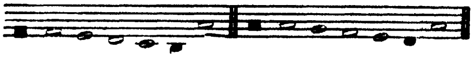
For a peculiarity in the construction of this melody, see note to the Tonic Sol-fa version (p. 96). The rhythm ♪ ♩. looks strange. It should be thought of as ♪ ♪ ♩ with the crotchet not *struck*, but
TAI-TAI-AA
smoothly held from the previous quaver.

FAH *below* DOH.

When doh is a line, low fah is two lines below.
Illustration.

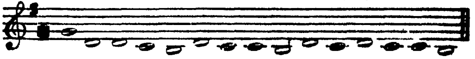


When doh is in a space, fah below is two spaces below.
Illustration.



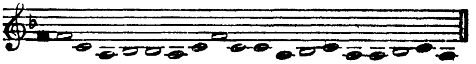
Ex. 75.

Doh is G. Low fah from low soh and low me.



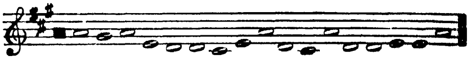
Ex. 76.

Doh is F. Low fah from low me.



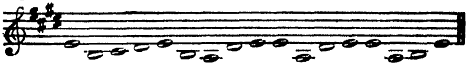
Ex. 77.

Doh is A. Low fah from doh.



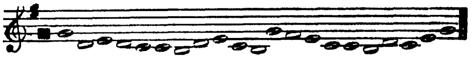
Ex. 78.

Doh is E. Low fah to te above.



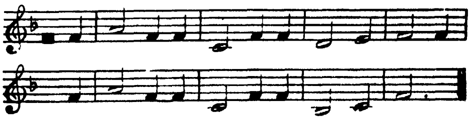
Ex. 79.

Doh is G. Low fah from low lah. The FAH chord.



Ex. 80.

Doh is F. Four-pulse measure. Doh to low soh and doh to low fah contrasted.



SIX-PULSE MEASURE—COMPOUND TIME.

It was stated in Vol. I., p. 158, that pulses can be arranged by accent in sets of twos or in sets of threes, and that these arrangements are respectively called DUPLE and TRIPLE TIME. Four-pulse measure (see Vol. I., p. 276) is therefore obviously a form of duple time, because it presents to the ear *two* sets of twos. Sometimes this form of measure is called QUADRUPLE (*i.e.*, four-fold) TIME. In the same manner, triple time is often presented in two sets of threes, a subordinate strong or MEDIUM accent distinguishing the first of every other set of three. Example:—

1	2	3	4	5	6
Strong	weak	weak	medium	weak	weak.

The resulting measure is called SIX-PULSE MEASURE, because the strongest accent comes once only in every six pulses. This time is also often called COMPOUND TIME, because it unites in one measure a broad duple time (when the strong and medium accents are compared) and a triple time (when the half-measures, or sets of threes, are observed). The features of compound time may then be summarised as follows:—

1. One strong pulse in six.
2. Medium accent at the *fourth* pulse, dividing the sixes into two threes.
3. The effect of duple time, when only the strong and medium accents are considered.

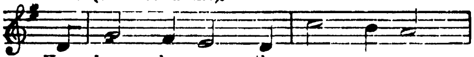
Example of six-pulse measure:—

Theme from

"HOW LOVELY ARE THE MESSENGERS."

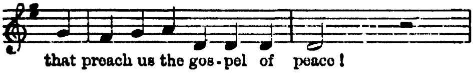
Chorus from "St. Paul," by Mendelssohn.

Doh is G (the second line).



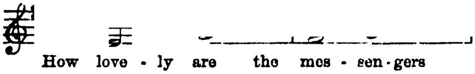
How love - ly are the mes - sen - gers

{ :s_1 |d :– :t_1 |l_1 :– :s_1 |f :– :m |r :– }



that preach us the gos - pel of peace!

{ :d |t_1 :d :r |s_1 :s_1 :s_1 |s_1 :– :–



How love - ly are the mes - sen - gers

{ :s_1 |l_1 :– :t_1 |d :– :r |t_1 :– :d |r :– }

that preach us the gos - pel of peace!

{ :f |m :r :d |r :l_1 :t_1 |d :– :– | : ||

NEW DIVISIONS OF THE PULSE.

As the various ways of dividing the pulse are unfolded in these lessons it will be seen that all the divisions are duple or triple in character; that is, they, as it were, present to the ear miniature measures in each pulse, or even in each division of a pulse. So far, only duple or, as they are often termed, *binary* (from Latin *bini*, by twos) divisions have been taught, because these are on the whole the easiest to sing. The division of a pulse into three equal parts, or the *ternary* (Latin *terni*, by threes) division, will be left to the next step. Two new binary divisions must be studied before the conclusion of the third step. These are the division of a beat or pulse between three struck tones, distributed as follows:—

A half-pulse and two quarters, *or*
Two quarter-pulses and a half.

A study of the time names for these divisions will give the best conception of their rhythmic effect. This conception should be gained before the notation is studied in either form. The names of the new divisions are directly derived from those already taught.

Time Name Table.

Both halves and four quarters.	The first half and last quarters.	The first quarters and last half
TAATAI	TAA	TAI
tafatefe.	tefe.	tafa

In pronouncing TAAtefe, care must be taken to give the full value to the TAA, and in pronouncing tafaTAI, the same care must be taken to say the first two syllables; and in each case the whole word of three syllables must be spoken in the same time as a full pulse TAA.

Ex. 78 (Tonic Sol-fa). Ex. 80 (Staff Notation).

TAA	TAA	TAATAI	TAA
TAAtefe	TAA	TAAtefe	TAA
TAAtefe	TAATAI	TAAtefe	TAA
TAAtefe	TAAtefe	TAAtefe	TAA
TAA	TAA	tafaTAI	TAA
tafaTAI	TAA	tafaTAI	TAA
TAA	tafaTAI	TAATAI	TAA
tafaTAI	tafaTAI	tafaTAI	TAA

SIX-PULSE MEASURE AND PULSE DIVISIONS.
(TONIC SOL-FA NOTATION.)

Six-pulse measure is shown as follows:—

| : : | : : |

Strong	weak	weak	medium	weak	weak.

As the effect of this measure is not very different from two three-pulse measures it will not be necessary to give many special exercises. The following will suffice, and at the same time give additional practice in leaping from tone to tone of the scale. The horizontal line under some of the notes shows the tones that have to be sung or *slurred* to one syllable of the words.

Ex. 79.

DRINK TO ME ONLY WITH THINE EYES.

Doh is E. Smoothly and slow.] *Old English Song.*

|m :m :m |f :—:f |s :f :m |r :m :f }

Drink to me on - ly with thine eyes, And
I sent thee late a ro - sy wreath, Not

```
|s :d :f |m :—:r |d :—:— |—:—: }
 I will pledge with mine;......
 so much hon - 'ring thee,......

|m :m :m |f :—:f |s :f :m |r :m :f }
 Or leave a kiss but in the cup, And
 As giv - ing it a hope that there It

|s :d :f |m :—:r |d :—:— |—:—:s }
 I'll not ask for wine;..... The
 could not with - er'd be; ...... But

|s :m :s |d¹:—:s |s :m :s |s :—:s }
 thirst that from the soul doth rise, Doth
 thou there - on did'st on - ly breathe, And

|l :—:s |s :f :m |m :—:— |r :—: }
 ask a drink di - vine, ......
 sent'st it back to me; ... .....

|m :m :m |f :—:f |s :f :m |r :m :f }
 But might I of Jove's nec - tar sup, I
 Since when it grows and smells, I swear, Not

|s :d :f |m :—:r |d :—: | : : ||
 would not change for thine.
 of it - self, but thee.
```

Ex. 80.—Round in three parts.

Doh is F.

```
|d :—:— |r :—:— |m :f :s |f :m :r }
*
 m :—:— |f :—:— |s :f :m |r :m :f }
|s :s.s:s |f :m :r |d :d.d:d |r :d :t₁ }
```

In order to accustom the eye to the appearance of the signs of the different pulse divisions, the student should write the following exercises:—

Ex. 81.—Write four six-pulse measures and four four-pulse measures.

Ex. 82.—Write four three-pulse measures.

PULSE DIVISIONS.

A half and two quarters—TAAtefe.

The notation of this division is derived from the previously-taught divisions.

```
A pulse halved by a dot in }
  the centre               } :     .    ||
The second half divided    }
  into quarters by a comma } :     . ,  ||
                             ½     ¼ ¼
Notes inserted in the spaces :l    .l,l ||
                             TAA   tefe
```

The effect of this division is lively and inspiriting. It will be best to practise it on a monotone before fitting it to the rise and fall of tones.

Ex. 83.—To be looked over slowly, pulse by pulse, and then monotoned regularly to time names, and afterwards to the syllable *laa*.

```
(a) |l :l |l .l,l:l |l .l,l:l .l }
           TAAtefe
    |l .l :l ||
(b) |l .l,l:l |l .l,l:l |l .l,l:l .l,l }
    |l .l :l ||
(c) |l .l :l |l,l.l,l:l |l .l :l .l,l }
    |l .l,l:l ||
(d) |l .l,l:l .l |l .l :l .l,l |l .l,l:l .l,l }
    |l .l,l:l ||
```

Each section should be sung over and over again before going to the next, until it can be performed with facility. Then the exercise should be sung straight through.

Ex. 84.

Doh is F.

```
|d .d,d:r .r,r |m .m :s |r .r,r:m .r }
|d .m :r |d .d,d:r .r,r |m .m :s }
|r .m,f:m .r,d |r .d :d ||
```

Two quarters and a half—tafaTAI.

The notation of this division will be understood from the following:—

```
A pulse halved by a dot in  }
  the centre                } :    .   ||
The first half divided into }
  quarters by a comma       } : ,  .   ||
                              ¼ ¼  ½
Notes inserted in the spaces  :l,l.l   ||
                              tafa TAI
```

The effect of this division is like that of TAAtefe—very lively. It is often used in dance rhythms, because it so plainly emphasises the beginnings of pulses.

Ex. 85.—See directions to Ex. 83 above.

```
(a) |l :l |l,l.l :l |l,l.l :l .l }
           tafaTAI
    |l .l :l ||
(b) |l,l.l :l |l,l.l :l |l,l.l :l,l.l }
    |l .l :l ||
```

(*c*) |l,l.l :l .l |l,l.l :l |l .l :l,l.l }
|l,l.l :l ||

(*d*) |l,l.l :l .l |l,l.l :l,l.l |l,l.l :l .l }
|l .l :l ||

The following well-known melody aptly illustrates the bright piquant effect of this division.

Ex. 86.

Doh is E LECOCQ.

|d .d :d,r.m |r .r :r,m.f |m .s :f .l }
|l .s :s |d^1 .d^1 :d^1,t.l |s .s :s,f.m }
|r .f :m .d |r .s :s . |d .d :d,r.m }
|r .r :r,m.f |m .s :f .l |l .s :s }
|d^1 .d^1 :d^1,t.l |s .s :s,f.m |r .f :m .s }
|l .t :d^1 ||

The following exercise combines the two new ways of dividing that are separately taught above. At first it should be practised very deliberately, and gradually the pace should be increased.

Ex. 87.—To be monotoned, etc.

(*a*) |l :l |l .l,l:l |l .l :l,l.l }
|l .l :l ||

(*b*) |l .l,l:l |l,l.l :l |l .l,l:l,l.l }
|l .l :l ||

(*c*) |l .l,l:l .l,l |l :l |l,l.l :l,l.l }
|l .l :l ||

(*d*) |l,l.l :l .l,l |l,l.l :l |l .l,l:l,l.l }
|l,l.l,l:l ||

The round below admirably illustrates the combination of "binary" divisions in one piece. It should be noted that each line commences and ends with a half-pulse note, and that the parts enter in turn after *two* lines have preceded. There must be no pause in going from one line to the next.

Ex. 88.—Round in three parts.

ALL NATURE SMILES.

Doh is G. ARNOLD.

{ .s_1 | d .d ,t_1 :l_1 .l_1 | r .r ,d :t_1 . }
All | Na - ture smiles to | greet fair Spring,

{ .t_1 | m .m ,r :d ,r .m ,f | s .s_1 :d . }
And | flow'rs their scent - ed | tri - bute bring;

{ *.r | m .m .r :d .d | f .f ,m :r . }
The | hap - py birds from | bloom - ing spray,

{ .r | s .s ,f :m ,r .d . | d .r :m . }
Their | wel - come sing with | mer - ry lay,

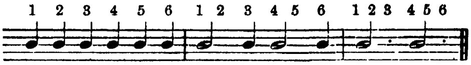
{ .s | s ,f .m ,s :d .m | r ,d .t_1 ,d :s_1 . }
With | merry, merry lay, with | merry, merry lay,

{ .t_1 | d .d ,r :m ,f .s | s ,s .s ,s :s .||
Their | wel - come sing with | merry, merry lay.

SIX-PULSE MEASURE (COMPOUND TIME) AND PULSE DIVISIONS.

(STAFF NOTATION.)

Six-pulse measure will be recognised by the occurrence of six crotchets, *or the value of six crotchets*, in each bar. Example:—



The medium accent on the fourth beat, or pulse, is not shown by a special sign.

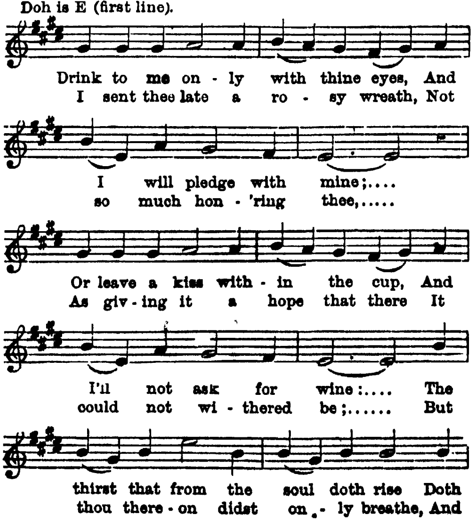
The graceful tune below forms an appropriate exercise in this measure. To express the value of five pulses, a dotted minim is "tied" by a curved line to a minim.

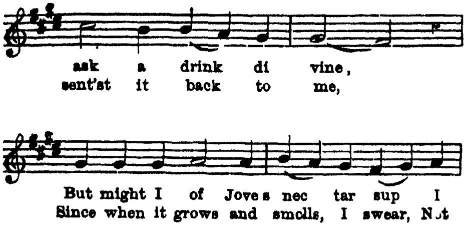
Ex. 82.

DRINK TO ME ONLY WITH THINE EYES.

Old English Song.

Doh is E (first line).


Drink to me on - ly with thine eyes, And
I sent thee late a ro - sy wreath, Not
I will pledge with mine;....
so much hon - 'ring thee,.....
Or leave a kiss with - in the cup, And
As giv - ing it a hope that there It
I'll not ask for wine:.... The
could not wi - thered be;...... But
thirst that from the soul doth rise Doth
thou there - on didst on - ly breathe, And


ask a drink di vine,
sent'st it back to me,
But might I of Jove's nec tar sup I
Since when it grows and smells, I swear, Not

DRAWING.—IX

[*Continued from p* 75]

FOLIAGE

Fig 87 is drawn from a pelargonium leaf, and a mixture of lines is employed, some more curvilinear than others, according to the rotundity of the surface copied, for it must be observed that in proportion as a rounded surface approaches the flat, so will it require straighter lines to represent it

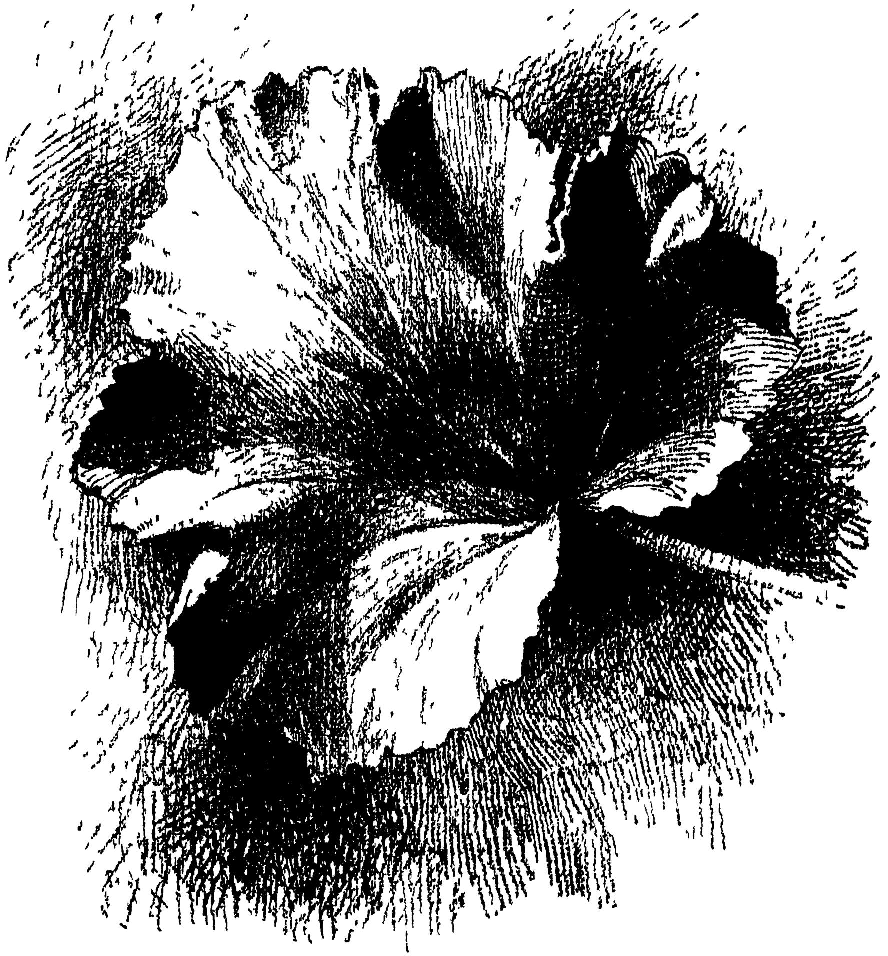
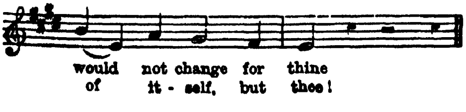


Fig 87



In a former lesson we mentioned the ***stump***, an instrument used for laying on a tint by rubbing; this may be used instead of the line method for rubbing in broad tints corresponding to the varying depths of shade in the object. Bread, rolled up between the fingers and thumb, should be used to lighten any passages that are too dark, and the chalk point may be employed where passages require strength. An effect can be much more readily produced with the stump, but the danger is lest the shadows should be made *dirty* or *cloudy*. After a little experience this method will be found to be quicker than doing it by lines.

We strongly advise the pupil to provide himself with a few plaster casts of leaves, fruits, and ornaments. The advantages of casts are many; they can be placed in any light, and they present so many different views that they may be said to be inexhaustible copies.

Our next subject will be the theory and practice of drawing foliage; by this we do not mean merely the leafage of trees, but we include all herbs and plants that enrich the ground, and add so materially to the effect of a picture by their variety of form, their colour, and their wild luxuriant growth. Trees in winter are not to some such interesting objects as they are when clothed with their summer foliage, but to the student they offer a strong claim to his attention, presenting many features which an uninterested eye would pass over as unworthy of regard. It is at this season that we have before us the *skeleton* or *framework* upon which depends the strength and proportion of the whole; to understand a tree thoroughly we must be fully acquainted with its anatomy—that is, the character and disposition of its branches. Trees individually differ as much in this respect as they do in their foliage, and therefore we are equally capable of distinguishing any particular tree in winter as we are in summer. Compare the branches of the oak with those of the poplar, the willow, or the cedar. The disposition of the oak, in a general way, is to send out its branches at right angles with the parent stem from which they spring; the poplar collects its branches closer together, and lifts them upwards parallel with the main trunk; the willow droops; and the cedar spreads out its branches horizontally. In short, each tree has its own marked characteristics in its ramifications, and is worthy of as much attention and study in winter as when covered with its fresh summer leaves.

To draw a tree successfully we must divide our attention between two important considerations. First, the trunk and its branches; second, the foliage. We repeat, that the first lesson to be received from Nature is at the time when the branches are totally bare of leaves, as then we can study to very great advantage the dispositions of the trunk and boughs of every kind of tree separately, which, as we have remarked, may be called the skeleton or framework of the tree, and it is evident, therefore, that the disposition of the foliage very materially depends upon the disposition of the branches.

We must now again recommend our pupils to follow out the first instructions we gave respecting the drawing of a line, by first *marking in* with a point the place where the tree rises from the ground; then observe the inclination of the trunk, and place another point at that part of the main trunk from which the first, and in most cases the largest branches start off; then observe the proportion that the remainder of the tree, as a whole, bears to the part already marked in, and with a few additional points determine the general size of the tree and the space it has to occupy upon the paper; then return to the points which are arranged for the commencement of the branches from the trunk, and mark in their courses and extent; join these points by lines, and lastly go through the same process with regard to the minor branches.

All this is a preparation for the completion of the drawing, and it will be necessary to follow out the method still farther for the more receding branches; in short, we must allow nothing to pass unnoticed in the arrangement that has the stamp of individuality upon it; after this the *drawing* will prove to be comparatively easy. When the *places* for the trunk, the most prominent boughs, and other branches are settled, the attention will only have to be directed to the *form* that each successive part presents. We will remind our pupils that there is a good moral maxim which we must follow in arranging the characteristic parts of a tree, as well as in anything else, as it contains a principle applicable to drawing that should not be disregarded: let each line *individually* be so placed that it may afford every advantage to its neighbour, and not take up even the very smallest amount of space which does not rightly belong to it, or cause an adjoining line to be pushed out of its proper position, or appear to claim for itself greater consideration than it justly deserves.

One of the greatest difficulties which the student will have to contend with in drawing foliage will be to retain the correct forms of the several masses of light and shade. There is no rigid outline to help him, and the natural tendency is, therefore, to lose the drawing altogether. In order to obviate this the subject must be considered broadly. See as little as possible of the small details. Half close the eyes, and the masses will define themselves into clear distinct forms. The chief trouble in drawing from nature is caused by seeing too much;

Fig 92

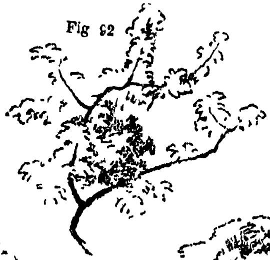
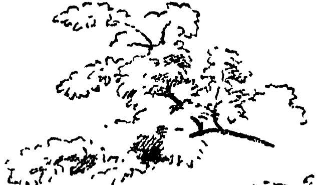


Fig 90



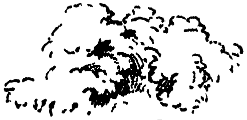
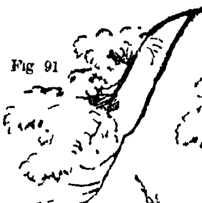


Fig 88

Fig 91



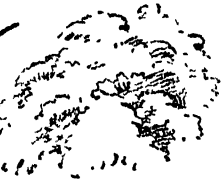


Fig 89

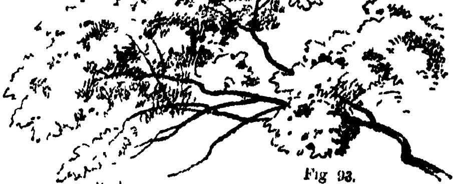


Fig 93.

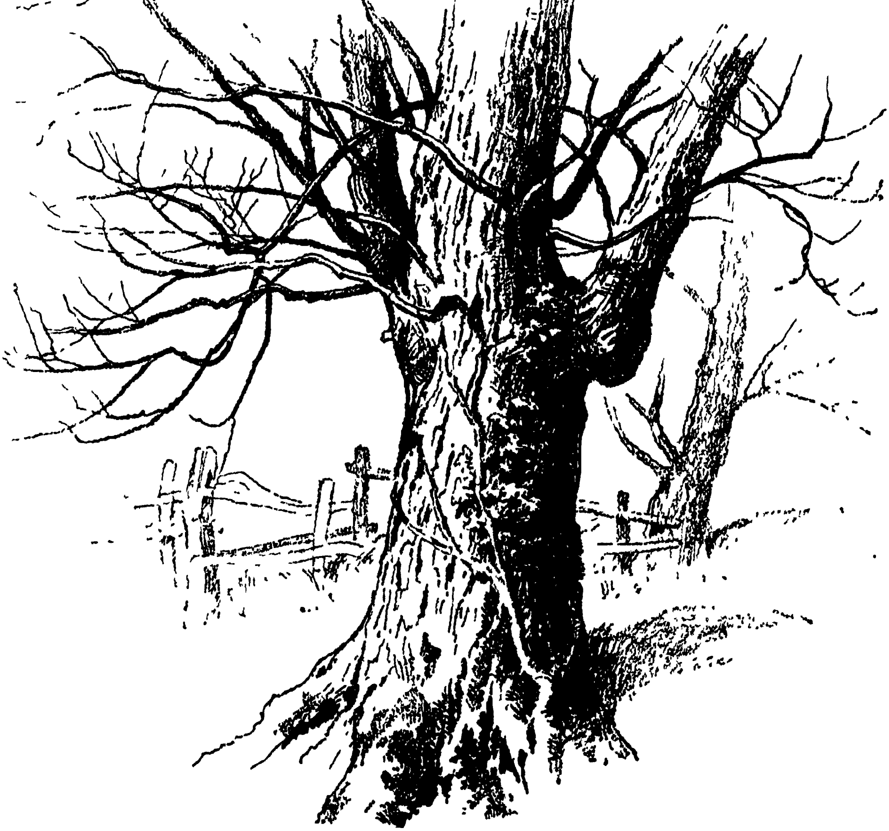


Fig 95.

"looking at little things; refusing to see broadly, to grasp a whole."

The first practical example we will give is Fig. 98, and relates to the drawing of the trunk and branches. As we have already given the principles which are to guide the pupil first for *arranging* the trunk and branches, and afterwards for *drawing* them, we will at once proceed to the foliage; and here we advise him to practise many times the examples from Fig. 88 to Fig. 97. The first two are merely *masses* of foliage, and it will require a considerable amount of repetition to secure a true and flowing manner of accomplishing this first difficulty in drawing foliage. Each example must be done, not by continued lines, but by broken touches, the only way to arrive at that light appearance peculiarly characteristic of foliage. The pencil may be allowed to press a little heavier on the under parts on the side opposite to the light, and it must be held almost perpendicularly, because in that position the pencil can be guided upwards, downwards, or to the right and left with equal ease and freedom; a tolerably soft pencil, say a B, will be the most suitable. To relieve the lights straight lines may be drawn at first, as in Figs. 92, 93, and afterwards the manner of Fig. 97 may be employed for the parts of the tree in shadow; but before attempting Fig. 97 let Fig. 96 be mastered, as the former is but a combination of the latter. Fig. 98 represents the branches of a tree as they are in winter, Fig. 99 shows them as they are when covered with foliage, as in summer; and we strongly advise the pupil to practise untiringly the drawing of the skeleton of trees as exemplified in Fig. 98, before attempting to clothe it in foliage as in the other example. We again repeat, all this will require a great deal of patient perseverance, for no one can expect to overcome the difficulties without making many failures; but we particularly recommend the pupil to execute very slowly and very carefully the first trials, and not on any account to attempt a sleight-of-hand kind of treatment, from a supposition that only a rapid movement of the pencil is necessary to accomplish the task.

Just as we impressed upon our readers the necessity of carrying on the education of the eye and brain for themselves in connection with all the earlier lessons, so does it become yet more important at the stage at which we have now arrived. We can but point out the infinite variety, and the peculiar characteristics of growth and foliage which each individual tree or plant possesses, but it rests with the student to train his powers of observation of all this by untiring and patient study of Nature herself.

Every faculty we have will grow dull and feeble if it is not constantly used; but by cultivation we can develop a very small germ of observation into a keen insight, and we trust that our pupils will not be content until they have accumulated such a store of mental photographs of the chief varieties of trees and their foliage, that the knowledge thus gained will rob any future drawing of half its difficulty.

From the observations we have made it will be understood that we fully intend the pupil should take Nature for his guide, yet we can assist him in this part of his study by introducing some examples, which he must copy as well as compare. Copying will not only be a practical benefit and aid to the pupil's skill, but will be also a means for establishing in his own mind the facts and principles we have endeavoured to make clear to him. Let him compare the outline of an oak with the outline of a lime tree. His attention must also be given to the bark, which in some trees—the oak and willow, for example—is hard and rough, while in the beech and birch it is smooth. The straight parts of the branches of some trees are short, from their slow growth, while others that increase more rapidly shoot forth their stems in one direction to a greater extent. The smaller twigs and shoots of some, like the birch, are very slender, numerous, and drooping; the horse-chestnut has fewer shoots, but they are thicker, and grow upwards.

In fact, as Ruskin says, "the task of the painter in his pursuit of ideal form is to attain accurate knowledge, as far as it may be in his power, of the character, habits, and peculiar virtues and duties of every species of being—down even to the stone (for there is an ideality of granite and slate and marble); and it is in the utmost and most exalted exhibition of such individual character, order, and use, that all ideality of art consists. The more cautious he is in assigning the right species of moss to its favourite trunk and the right kind of weed to its necessary stone—in marking the definite and characteristic leaf, blossom, seed, fracture, colour, and inward anatomy of everything—the more truly ideal his work becomes. All confusion of species, all careless rendering of character, all unnatural and arbitrary association, is vulgar and unideal in proportion to its degree."

Much more might be added to our consideration of this important subject, but we think enough has been said to point out the way, and we trust that our pupils will perfectly comprehend our intention by these remarks, and will be prepared to accompany us further in the consideration of the difficult subject of drawing foliage.

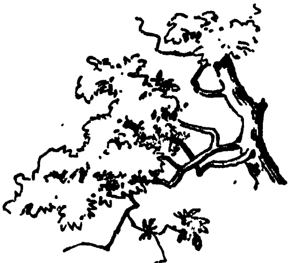


Fig. 94.

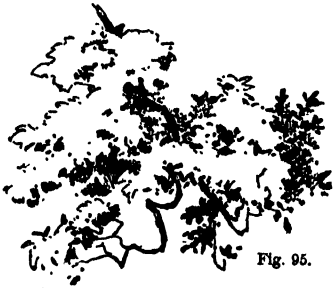


Fig. 95.

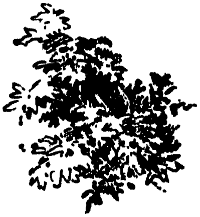


Fig. 96.

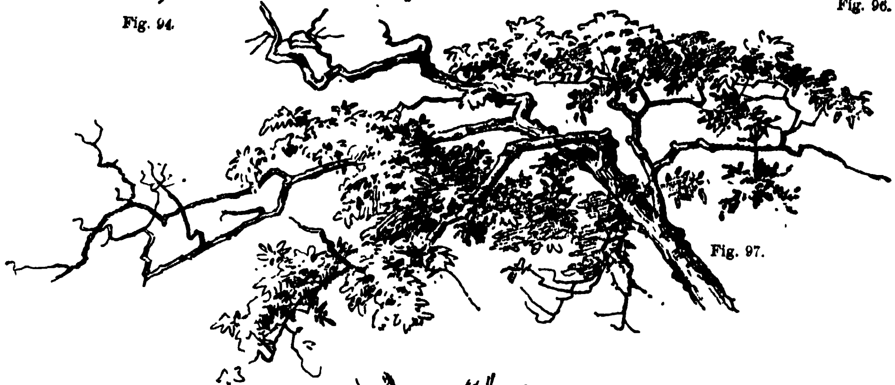


Fig. 97.

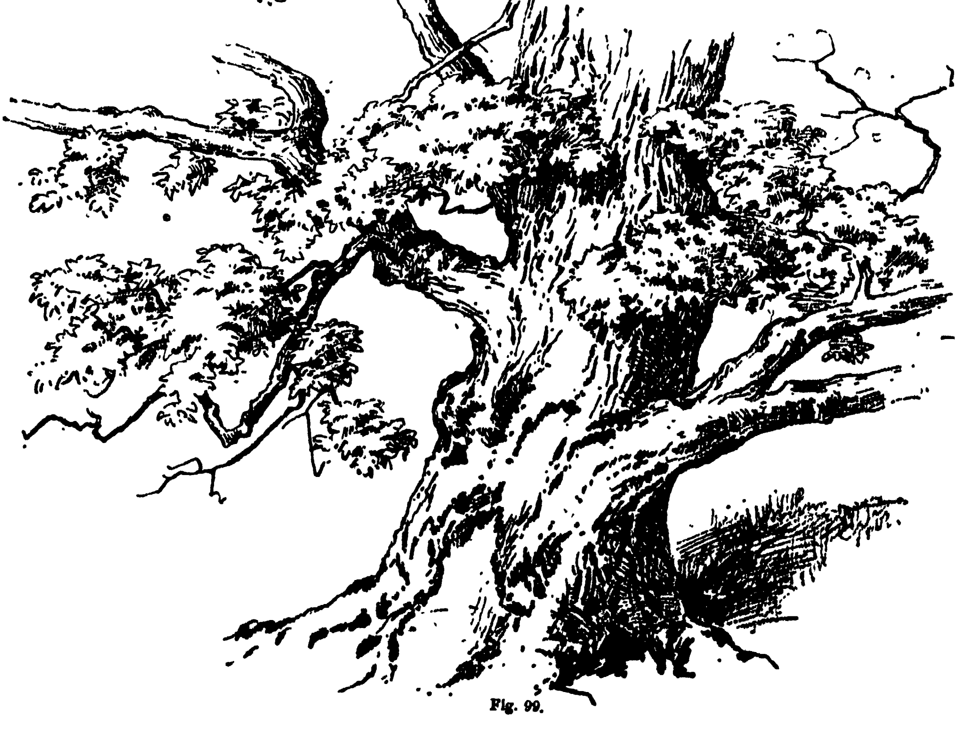


Fig. 99.

FRENCH.—IX.

[*Continued from p. 121.*]

POSITION OF THE PRONOUNS.

When two pronouns occur, one used as a direct object of the verb (accusative) and the other as the indirect object (dative), the indirect object, if not in the third person singular or plural, must precede the direct object.

Je vous le donne.	*I give it to you.*
Il me le donne.	*He gives it to me.*
Il nous le donne.	*He gives it to us.*

When the pronoun used as an indirect object is in the third person singular or plural it must be placed after the direct object.

Nous le lui donnons.	*We give it to him.*
Nous le leur donnons.	*We give it to them.*

The above rules of precedence apply also to the imperative used negatively :—

Ne nous le donnez pas.	*Do not give it to us.*
Ne le lui donnez pas.	*Do not give it to him.*

With the imperative used affirmatively the direct object precedes in all cases the indirect object.

Donnez-le-nous.	*Give it to us.*
Montrez-le-leur.	*Show it to them.*

En and *y* always follow the pronouns ; *en* follows *y* when both are used in the same sentence :—

Je lui en donne.	*I give him some.*
Il nous y envoie.	*He sends us thither.*
Il nous y en a envoyé.	*He has sent some to us there.*
Envoyez-leur-y-en.	*Send some to them there.*

PRESENT INDICATIVE OF THE IRREGULAR VERBS.

Voir, *to see.*	Vouloir, *to will, to be willing.*	Pouvoir*, *to be able.*
Je vois, *I see, do see,* or *am seeing.*	Je veux, *I will,* or *am willing.*	Je puis, *I can, I may, I am able.*
Tu vois.	Tu veux.	Tu peux.
Il voit.	Il veut.	Il peut.
Nous voyons.	Nous voulons.	Nous pouvons.
Vous voyez.	Vous voulez.	Vous pouvez.
Ils voient.	Ils veulent.	Ils peuvent.

The above verbs take no preposition before another verb.

The preposition *pour* is used to render the preposition *to*, when the latter means *in order to.*

Je vais chez vous pour parler à votre frère et pour vous voir.	*I go to your house to speak to your brother and to see you.*
J'ai besoin d'argent pour acheter des marchandises.	*I want money to* (*in order to*) *buy goods.*

MISCELLANEOUS EXAMPLES.

Voulez-vous nous le donner?	*Will you give it to us?*
Je veux vous le prêter.	*I will lend it to you.*
Pouvez-vous me les donner?	*Can you give them to me?*
Je ne puis vous les donner.	*I cannot give them to you.*
Votre frère peut-il le lui envoyer?	*Can your brother send it to him?*
Il ne veut pas le lui envoyer.	*He will not send it to him.*
Qui veut le leur prêter.	*Who will lend it to them?*
Personne ne veut le leur prêter.	*No one will lend it to them.*
Envoyez-les-nous.	*Send them to us.*
Ne nous les envoyez pas.	*Do not send them to us.*
Donnez-nous-en.	*Give us some.*
Ne leur en envoyez pas.	*Do not send them any.*
Envoyez-le-leur, pour les contenter.	*Send it to them to satisfy them.*
Je vous y en enverrai.	*I will send you some there.*
Je puis vous l'y envoyer.	*I can send it to you there.*

VOCABULARY.

Commis, m. *clerk.*
Connaissance, f. *acquaintance.*
Croire, 4, ir. *to believe.*
Dette, f. *debt.*
Marchande de modes, f. *milliner.*
Montr-er, 1, *to show.*
Oubli-er, 1, *to forget.*
Pay-er, 1, *to pay.*
Poisson, m. *fish.*
Pologne, f. *Poland.*
Prêt-er, 1, *to lend.*
Semaine, f. *week.*
Si, *if.*
Souvent, *often.*
Voyage, m. *journey.*

EXERCISE 59.

Translate into English :—

1. Voulez-vous donner ce livre à mon frère? 2. Je puis le lui prêter, mais je ne puis le lui donner. 3. Voulez-vous nous les envoyer? 4. La marchande de modes peut vous les envoyer. 5. Les lui montrez-vous? 6. Je les vois et je les lui montre. 7. Avez-vous peur de nous les prêter? 8. Je n'ai pas peur de vous les prêter. 9. Ne pouvez-vous nous envoyer du poisson? 10. Je ne puis vous en envoyer, je n'en ai guère. 11. Voulez-vous leur en parler? 12. Je veux leur en parler, si je ne l'oublie pas. 13. Venez-vous souvent les voir? 14. Je viens les voir tous les matins, et tous les soirs. 15. Ne leur parlez-vous point de votre voyage en Pologne? 16. Je leur en parle, mais ils ne veulent pas me croire. 17. Est-ce que je vois mes connaissances le lundi? 18. Vous les voyez tous les jours de la semaine. 19. Vous envoient-ils plus d'argent que le commis de notre marchand? 20. Ils m'en envoient plus que lui. 21. En envoyez-vous au libraire? 22. Je lui en envoie quand je lui en dois. 23. N'avez-vous pas tort de lui en envoyer? 24. Je ne puis avoir tort de payer mes dettes. 25. Ils vous en donnent, et ils vous en prêtent quand vous en avez besoin.

EXERCISE 60.

Translate into French :—

1. Will you send us that letter? 2. I will send it to you if you will read it. 3. I will read it if I can. 4. Can you lend me your pen? 5. I can lend it to you if you will take care of it. 6. May I speak to your father? 7. You may speak to him, he is here. 8. Are you afraid of forgetting it? 9. I am not afraid of forgetting it. 10. Will you send them to him? 11. I intend to send them to him if I have time. 12. Do you speak to him of your journey? 13. I speak to him of my journey. 14. I speak to them of it. 15. Can you communicate it to him. 16. I have a wish to communicate it to him. 17. Do you see your acquaintances every Monday? 18. I see them every Monday and every Thursday. 19. Where do you intend to see them? 20. I intend to see them at your brother's and at

---

* After the verbs **pouvoir**, *to be able;* **oser**, *to dare;* **savoir**, *to know;* the negative *pas* may be omitted.

your sister's. 21. Can you send him there every day? 22. I can send him there every Sunday if he wishes. 23. Can you give them to me? 24. I can give them to you. 25. Who will lend them books? 26. No one will lend them any. 27. Is he at home? 28. He is at his brother's. 29. Will you send it to us? 30. I am willing to send it to you if you want it. 31. Are you willing to give them to us? 32. We are willing to give them to your acquaintances. 33. Have you sent some to them there? 34. Yes, I have sent some to them there.

EXCEPTIONS TO THE ABOVE RULES ON THE PRONOUNS.

In the cases mentioned below the personal pronouns, used as direct objects, are placed after the verb in a simple tense, or after the past participle in a compound tense; they are then expressed as follows, viz.:—*me* by **moi**, *thee* by **toi**, *him* by **lui**, *her* by **elle**, *us* by **nous**, *you* by **vous**, *them* (m.) by **eux**, *them* (f.) by **elles**:

1stly, when the verb has several direct objects, whether they are all pronouns, or nouns and pronouns:—

Je connais elle et eux.	*I know her and them.*
J'ai vu elle et sa sœur.	*I have seen her and her sister.*
Il regardait tantôt vous, tantôt moi.	*He looked now at you, then at me.*

2ndly, when the verb is accompanied by *ne . . . que* referring to the pronoun: *—

Je ne crains que lui.	*I fear him only.*
Ils n'ont vu que moi.	*They saw me only.*

Again, the personal pronouns in the dative case are expressed as above, and placed after the preposition *à*, which of course is put after the verb in a simple tense, and after the past participle in a compound tense:

1stly, when the verb has several objects in the dative case, whether they are all pronouns, or nouns and pronouns:—

Je parle à vous et à lui.	*I speak to you and to him.*
J'ai écrit à elles et à leur frère.	*I wrote to them and to their brother.*

2ndly, when the pronoun which is the direct object and the pronoun in the dative case are of the first and second person:—

Il te confiera à nous.	*He will entrust thee to us.*
Le roi m'a envoyé à vous.	*The king has sent me to you.*

3rdly, when the direct object is a pronoun of the first or second person, and the dative one of the third:—

Votre frère vous présentera à eux.	*Your brother will introduce you to them.*
Votre oncle nous à envoyés à elle.	*Your uncle has sent us to her.*

4thly, with the following verbs: **aller**, *to go*; **courir**, *to run*; **accourir**, *to run up*; **boire à**, *to drink to*; **penser**, **songer**, *to think*; **venir**, *to come*; **revenir**, *to come back*, *to come again*; **être**, in the sense of *to belong*; **appeler**, *to call*; **rappeler**, *to call again*, *to call back*; **attirer**, *to attract*:*—

Elle courut à lui.	*She ran up to him.*
Ce cheval est à moi.	*This horse belongs to me.*

5thly, with idiomatic verbal expressions, such as, **avoir affaire**, *to have to do* or *to deal with*; **avoir rapport**, *to concern*, *to bear upon*; **avoir égard**, *to consider*, *to show regard*; **avoir recours**, *to have recourse*; **prendre garde**, *to beware*, *to take care*, *to mind*; **prendre intérêt**, *to take interest in*; **faire attention**, *to pay attention*, *to notice*, &c.:—

Nous aurons recours à toi.	*We will have recourse to thee.*
Il faut prendre garde à soi.	*One must take care of oneself.*
Je n'ai pas fait attention à elle.	*I did not notice her.*

6thly, for the sake of emphasis, in elevated style:—

Sachez-le bien, je parle à vous!	*Know it well, I speak to you!*

7thly, with all reflective verbs:—

Le ministre s'adressait à eux.	*The minister used to apply to them.*
Le tailleur ne s'était pas fié à eux.	*The tailor had not trusted them.*

8thly, when the verb is accompanied by *ne . . . que*, referring to the pronoun: †—

Je ne parle qu'à vous.	*I speak to you only.*
Ils n'avaient écrit qu'à elle.	*They had written to her only.*

MISCELLANEOUS EXAMPLES.

J'ai chargé elle et lui de le faire.	*I have ordered her and him to do it.*
Il saura bien empêcher vous et ses autres ennemis de lui nuire.	*He will know well how to prevent you and his other enemies from injuring him.*
Ils ne connaissent que moi ici.	*They know me only here.*
Mon cousin a écrit à toi et à ta sœur.	*My cousin has written to thee and to thy sister.*
Le ministre a promis à nous et á eux qu'elle serait graciée.	*The minister has promised to us and to them that she would be pardoned.*
Votre père vous confiera à moi pendant le voyage.	*Your father will entrust you to me during the voyage.*
Mon frère m'a envoyé à vous hier.	*My brother sent me to you yesterday.*
Je ne veux pas t'envoyer à lui.	*I will not send thee to him.*
Il ne me confiera pas à eux.	*He will not entrust me to them.*
Il faut songer à soi.	*One must think of oneself.*
Cela a rapport à vous.	*That concerns you.*
Il ne se fie pas à toi.	*He does not trust thee.*
Je déclare á vous, à vous, que cela est faux!	*I declare to you, to yourself, that that is untrue!*
Prenez garde à vous!	*Mind, take care of, yourself!*
Il n'écrira qu'à eux.	*He will write to them only.*

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* *Ne . . . que* has no influence on the position of the pronoun when it does not refer to it:—**Je ne l'ai vu que deux fois**, *I saw him twice only.*

* Used figuratively, *attirer* is preceded by its pronoun object:—**Sa paresse lui attirait constamment des reproches,** *his idleness constantly brought reproaches upon him.*

† When *ne . . . que* does not refer to the pronoun it has no influence on the place of the latter:—**Elle ne m'a parlé que de son fils**, *she spoke to me of nothing but her son.*

VOCABULARY.

Adressé, *addressed, sent.*
Aperçu, *perceived.*
Appuyé, *supported.*
Aussitôt, *as soon.*
Calomnié, *slandered.*
Calomnies, f. *calumnies.*
Comtesse, f. *countess.*
Confié, *entrusted.*
Connaît-re, 4, *to know.*
Courut, *ran.*
Crédit, m. *credit.*
Dit, *told.*
En cas de besoin, *in case of need.*
Fois, f. *times.*
Général, m. *general.*
Ici, *here.*
Il faut, *it is necessary, one should.*
Nous nous fions, *we trust.*
Nui, *injured.*
[illegible] *because.*
Pour que } *in order*
Afin que } *that.*
Présent-er, 1, *to introduce.*
Reconnu, *recognised.*
Regardé, *looked at.*
Remarqué, *remarked.*
Roi, *king.*
S'adress-er, 1, *to apply.*
Seule, *single, one.*
Termin-er, 1, *to settle.*
Tout, *all.*
Tuteur, m. *guardian.*
Une fois, *once.*
Ville, f. *town.*
Vu, *seen.*

EXERCISE 61.

Translate into English:—

1. J'ai vu lui et son père. 2. Nous avons reconnu sa mère et elle. 3. Tu as calomnié moi, elle, et eux. 4. Avez-vous remarqué la comtesse et lui? 5. Ils ont appuyé toi et ton cousin de tout leur crédit. 6. Je ne connais que lui ici. 7. Il ne veut voir qu'elle. 8. En trois mois, tu ne m'as écrit que deux fois. 9. Il ne vous a regardés qu'une seule fois. 10. Votre commis a-t-il écrit à vous et à votre associé? 11. Oui, il a écrit plusieurs fois à mon associé et à moi. 12. Vos calomnies ont nui à elle, à lui, et à moi. 13. Ils nous envoient à vous pour terminer cette affaire. 14. Votre mère vous a adressé à moi pour que je vous présente à eux. 15. Mon tuteur m'a confié à elle parce qu'il ne connaît qu'elle dans cette ville. 16. Nous courûmes à lui aussitôt que nous l'eûmes aperçu. 17. Votre frère aura recours à vous, en cas de besoin. 18. Le roi s'adressa à eux plusieurs fois. 19. Prends garde à toi. 20. Elle n'a parlé qu'à vous. 21. Faites attention à eux.

EXERCISE 62.

Translate into French:—

1. Have you seen her and her father? 2. Hast thou recognised his mother and him? 3. Have they slandered thee, him, her, and me? 4. We have seen the baroness and him. 5. They have supported your uncle and you with all their credit. 6. I only know them (*f.*) here. 7. We are willing to see them (*m.*) only. 8. In a year she wrote to me only once. 9. In three hours you looked at me but once. 10. My clerk has written to you and to your partner. 11. Have you spoken several times to them (*m.*) and to the prince? 12. Why have you injured her, him, and me? 13. Have they sent you to me to settle our affair? 14. Your father has sent me to you that you should introduce me to her. 15. The general had entrusted me to them because he knew only them in that town. 16. My mother ran up to me and told me she had always thought of me. 17. This concerns me. 18. We trust them (*m.*). 19. One should take care of oneself. 20. I will write to you only. 21. They have paid attention to us.

USE OF THE DEFINITE ARTICLE.

The article *le, la, les*, as already stated, is used in French before nouns taken in a general sense:—

Les jardins sont les ornements des villages et des campagnes.	*Gardens are the ornaments of villages and of rural districts.*

The article is also used in French, as in English, before nouns taken in a particular sense:—

Les jardins de ce village sont superbes.	*The gardens of this village are splendid.*

It is also used before abstract nouns, before verbs, adjectives, or any other part of speech used substantivally. This differs entirely from the English usage:—

La paresse est odieuse.	*Idleness is odious.*
La jeunesse n'est pas toujours docile.	*Youth is not always tractable.*
Le boire et le manger sont nécessaires à la vie.	*Eating and drinking are necessary to life.*
Les mais, les si, les car arrêtent tout	*Buts, ifs, fors stand in the way of everything.*

The article is used before the names of countries, provinces, rivers, winds, and mountains:—

La France est plus grande que l'Italie.	*France is larger than Italy.*
La Normandie est très fertile.	*Normandy is very fertile.*

The article is used before titles followed by the name:—

Le général Cavaignac.	*General Cavaignac.*
Le maréchal Ney.	*Marshal Ney.*

In respectful address or discourse, the words *Monsieur*, *Madame*, *Mademoiselle* are placed before titles and designations of relationship:—

Monsieur le président.	*(Mr.) President.*
Madame la comtesse.	*(Madam) Countess.*
Mademoiselle votre sœur.	*(Miss) your sister.*

The plural of ***Monsieur***, ***Madame***, and ***Mademoiselle*** is ***Messieurs***, ***Mesdames***, and ***Mesdemoiselles***.

The student should be careful to distinguish a noun taken in a general or in a particular sense from one taken in a partitive sense.

General or particular sense.	*Partitive sense.*
Nous aimons les livres.	Nous avons des livres.
We like books.	*We have books*, i.e. *some books.*
Nous avons les livres.	Vous avez écrit des lettres.
We have the books.	*You have written letters*, i.e. *some letters.*

Adjectives expressing nationality used substantivally to denote the language spoken by any nation are preceded by the article in French, but not in English:—

Il apprend le français, l'anglais, l'allemand, et l'italien.	*He learns French, English, German, and Italian.*

After the verb *parler* the article must be omitted before these adjectives:—

Votre frère parle espagnol et portugais.	*Your brother speaks Spanish and Portuguese.*

The article is not used in French before the number which follows the name of a sovereign. This number (unless it be *first*) must be the cardinal, and not the ordinal:—

Vous avez l'histoire de Henri quatre.	*You have the history of Henry the Fourth.*

A noun used as a predicate with the verb **être**, *to be*, is not in French preceded by **un**, **une**, *a* or *an*, as it is in English, unless it be qualified by an adjective or determined by the following part of the sentence:—

Votre ami est médecin.	*Your friend is a physician.*
Notre frère est avocat.	*Our brother is a barrister.*
Votre ami est un bon médecin.	*Your friend is a good physician.*
Notre frère est un avocat célèbre.	*Our brother is a celebrated barrister.*

KEY TO EXERCISES.

Ex. 51.—1. Will you take your children to school? 2. I will take them to school and to church. 3. Will the gardener bring vegetables to market? 4. He will bring some there. 5. Where will you take that horse? 6. I will take it to the stable. 7. Will you feed it? 8. I will give it hay and oats. 9. Will you give it water? 10. I will take it to the watering-place. 11. Will you pay what you owe? 12. Will you not take a walk? 13. I will take a walk this afternoon. 14. Will you take a walk or a ride? 15. I will take a ride, and my sister will take a drive. 16. Will you walk much in your journey to Paris? 17. We will not walk at all. 18. Will you not call the pedlar? 19. I shall not call him. 20. Will you not buy that country-house? 21. We will buy it if we can. 22. Will it not freeze this night? 23. I do not think so; it is too warm. 24. Will you not sow all the wheat which you (*will*) harvest? 25. I shall only sow a part of it; I shall sell the remainder. 26. I will seal my letters and (*I will*) carry them to the post-office.

Ex. 52.—1. Le monsieur n'appellera-t-il pas ses enfants? 2. Il appellera ses enfants et ceux de sa sœur. 3. N'amènerez-vous pas vos enfants? 4. Je ne puis les amener. 5. Ne voulez-vous pas vous promener à cheval cette après-midi? 6. Nous nous promenerons en voiture demain. 7. N'achèterez-vous pas les chevaux de mon père? 8. Je ne les achèterai pas, je n'ai pas d'argent. 9. N'appellerez-vous pas le colporteur? 10. Je ne veux pas l'appeler, je ne veux rien acheter. 11. Payerez-vous le tailleur? 12. Je lui payerai mon habit. 13. Ne gèlera-t-il pas demain? 14. Il gèlera demain; il fait très froid. 15. Ne sèmerez-vous pas de l'avoine dans ce champ? 16. Je n'y sèmerai pas d'avoine; j'y sèmerai du blé. 17. Mènerez-vous votre sœur à l'école? 18. Je l'y mènerai cette après-midi. 19. Ne mènerez-vous pas votre fils au marché? 20. Je ne l'y mènerai pas. 21. Le jardinier ne mènera-t-il pas son cheval à l'abreuvoir? 22. Il l'y mènera. 23. Donnerez-vous de l'avoine à votre cheval? 24. Je lui donnerai du foin. 25. Amènerez-vous votre fils? 26. Je l'amènerai demain. 27. Amènera-t-il son cheval? 28. Il amènera son cheval et sa voiture. 29. Pourquoi portez-vous ce petit enfant? 30. Il est trop malade pour marcher. 31. M. votre frère vendra-t-il ses propriétés? 32. Il n'en vendra qu'une partie. 33. Votre domestique ne portera-t-il pas la lettre à la poste? 34. Je la cachetterai et je la lui donnerai. 35. Donnerez-vous à manger à mon cheval? 36. Je lui donnerai à manger et à boire.

Ex. 53.—1. What coat would you put on if you went out? 2. I would put on a green coat. 3. Would you not take off your boots if they were wet? 4. I would take them off. 5. If you were cold would you not be unhappy? 6. I should be very unhappy. 7. Would not your little boy be ill if he were too warm? 8. He would be ill very quickly. 9. Would you mislay my books if you had them. 10. I would never mislay them. 11. Would you not put on a black hat if you went out? 12. I would put on a white hat; it is too warm to wear a black hat. 13. Would you pay this visit if I invited you? 14. I would come with much pleasure. 15. Would you not take my books if you went out? 16. I should certainly take them. 17. Would you not speak to him about your business? 18. I would speak to him of it. 19. How much money would you have if your uncle were dead? 20. I should have ten thousand francs. 21. If I were in your place, I would pay him what I owe him. 22. If I had time I would willingly carry your letters to the post-office.

Ex. 54.—1. Ne liriez-vous pas si vous aviez le temps? 2. Je lirais deux heures tous les jours si j'avais le temps. 3. Quel habit mettrait M. votre frère, s'il sortait? 4. Il mettrait un habit noir. 5. Mettriez-vous un chapeau noir? 6. Je mettrais un chapeau de paille, s'il faisait chaud. 7. Ne vous sécheriez pas vos habits, s'ils étaient mouillés? 8. Nous sécherions nos habits. 9. N'ôteriez-vous pas votre habit? 10. Je l'ôterais s'il était mouillé. 11. Payeriez-vous une visite à mon père, s'il vous invitait? 12. Je lui payerais une visite, s'il m'invitait. 13. Mettriez-vous vos bottes, si elles étaient mouillées? 14. Si elles étaient mouillées, je ne les mettrais pas. 15. Combien d'argent auriez-vous si vous demeuriez en Angleterre? 16. Nous aurions trois mille francs. 17. Liriez-vous le livre si je vous le prêtais? 18. Je le lirais certainement. 19. Si vous étiez à ma place, lui écririez-vous? 20. Je lui écrirais tous les jours. 21. Si vous étiez à sa place, payeriez-vous ce qu'il doit? 22. Si j'étais à sa place, je le payerais.

Ex. 55.—1. Where are you going, my friend? 2. I am going to your father's; is he at home? 3. He is this morning. 4. Whence do you come? 5. We come from your house and from your sister's. 6. Who is at our house? 7. My neighbour is there to-day. 8. Where do you intend to take these books? 9. I intend to take them to the house of the physician's son. 10. Are you wrong to remain at home? 11. I am not wrong to remain at home. 12. Has the watchmaker good watches at his house? 13. He has no watches at his house; he has some in his warehouse. 14. To whose house do you take your books? 15. I take them to the binder's. 16. Do you go to the Dutch captain's? 17. We do not go to the Dutch captain's, we go to the Russian major's. 18. Is he at your house or at your brother's? 19. He lives at our house. 20. Do we not live at your tailor's? 21. You do. 22. Whence does the painter come? 23. He comes from his partner's house? 24. Where do you take my shoes and my waistcoat? 25. I am taking your shoes to the shoemaker's and your waistcoat to the tailor's.

Ex. 56.—1. Où votre ami va-t-il? 2. Il va chez vous ou chez votre frère. 3. N'a-t-il pas l'intention d'aller chez votre associé? 4. Il a l'intention d'y aller, mais il n'a pas le temps aujourd'hui. 5. De quoi avez-vous besoin aujourd'hui? 6. J'ai besoin de mon gilet, qui est chez le tailleur. 7. Vos habits sont-ils chez vous? 8. Ils n'y sont pas, ils sont chez le tailleur. 9. Où demeurez-vous? 10. Je demeure chez ma belle-sœur. 11. Monsieur votre père est-il à la maison? 12. Non, il n'y est pas. 13. Où votre domestique porte-t-il le bois? 14. Il le porte chez moi. 15. Le monsieur qu'est avec Monsieur votre père, demeure-t-il chez lui? 16. Non, il demeure chez moi. 17. D'où le marchand vient-il? 18. Il vient de chez son associé. 19. A-t-il deux associés? 20. Non, Monsieur, il n'en a qu'un, qui demeure ici. 21. Avez-vous le temps d'aller chez nous ce matin? 22. Nous avons le temps d'y aller. 23. Nous avons l'intention d'y aller et de parler à Mademoiselle votre sœur. 24. Est-elle chez vous? 25. Elle est chez elle. 26.

Votre montre est-elle chez l'horloger? 27. Elle y est. 28. Avez-vous deux montres d'or? 29. Je n'ai qu'une montre d'or? 30. Qui a l'intention d'aller chez mon père ce matin? 31. Personne n'a l'intention d'y aller.

Ex. 57.—1. What are you going to do? 2. I am going to learn my lessons. 3. Are you not going to write to your acquaintances? 4. I am going to write to nobody. 5. Who has just spoken to you? 6. The Irishman has just spoken to us. 7. When is the Scotch lady going to teach you music? 8. She is going to teach me next year. 9. Is she going to commence on Tuesday or on Wednesday? 10. She is going to commence neither on Tuesday nor on Wednesday; she intends to commence on Thursday, if she has time. 11. Does your companion go to church every Sunday? 12. She goes every Sunday and every Wednesday. 13. To whom do you go? 14. I do not go to anyone. 15. Do you not intend to come to me to-morrow? 16. I intend to go to your dyer. 17. Do you send for the physician? 18. When I am ill I send for him. 19. Does he remain with you the whole day? 20. He remains with me only a few minutes. 21. Do you go to school in the morning? 22. I go in the morning and in the afternoon. 23. Do you go every day. 24. I go every day, except Monday and Sunday. 25. Saturday I remain at home, and Sunday I go to church.

Ex. 58.—1. L'Irlandais que va-t-il faire? 2. Il va enseigner la musique. 3. Vient-il de commencer son travail? 4. Il vient de le commencer. 5. Qui vient de vous écrire? 6. Le teinturier vient de m'écrire. 7. Votre petit garçon va-t-il a l'église tous les jours? 8. Non, Monsieur, il va à l'église le dimanche, et il va à l'école tous les jours. 9. Envoyez-vous chercher le médecin? 10. Je l'envoie chercher parce que ma sœur est malade. 11. Allez-vous trouver mon médecin ou le vôtre? 12. Je vais trouver le mien, le vôtre n'est pas à la maison. 13. Où est-il? 14. Il est chez M. votre père ou chez M. votre frere. 15. Avez-vous l'intention d'envoyer chercher le médecin? 16. J'ai l'intention de l'envoyer chercher. 17. Ai-je raison d'envoyer chercher l'Écossais? 18. Vous avez tort de l'envoyer chercher. 19. Allez-vous trouver M. votre père l'après-midi? 20. Je vais le trouver le matin. 21 Votre frère va-t-il chez votre oncle tous les lundis. 22. Il y va tous les dimanches. 23. Allez-vous apprendre la musique? 24. Ma niece va l'apprendre, si elle a le temps. 25. Est-ce que je vais lire ou ecrire? 26. Vous allez lire demain. 27. Va-t-il chez vous tous les jours? 28. Il vient vous trouver tous les mercredis. 29. À quelle heure? 30. À neuf heures moins un quart. 31. Vient-il de bonne heure ou tard? 32. Il vient à neuf heures et quart. 33. Qu'envoyez-vous chercher? 34. Nous envoyons chercher du vin, du pain, du beurre, et du fromage. 35. Qu'allez-vous chercher? 36. Nous allons chercher des légumes, de la viande, et du sucre.

GEOGRAPHY.—IX.

[*Continued from p.* 124.]

AFRICAN POSSESSIONS OF GREAT BRITAIN.*

Cape Colony proper, taken from the Dutch in 1806, lies to the south of the Orange or Nu Gariep River, which flows westward to the Atlantic between the parallels of 28° and 31° S. lat. Griqualand West, Bechuanaland, Walfisch Bay, and much of Basutoland lie north of that river, the northern boundary of British territory being the parallel of 22° S., and the colony extends southward to 34° 50′ S. The mouth of the Orange River is in E. long. 16° 25′, and that of the Great Kei River about 29° E.; but Walfisch Bay is in about 14° 45′ E., and the mouth of the Umzimkulu, the boundary of Natal, in 30° E. Capetown, the capital, is in lat. 34° 56′ S., approximately the same as that of Buenos Ayres, Monte Video, and Adelaide; and 1° south of Valparaiso and Sydney, and in 18° 27′ E. long., nearly that of Stockholm and Brindisi. Capetown time is thus about 1¼ hours fast by Greenwich. The colony, including Griqualand West and the Transkei, has an area of nearly 220,000 square miles, or 2½ times that of Britain, and a coast-line of about 1,300 miles, or one mile to every 169 square miles.

The surface rises from the south coast in a series of mountain ranges, separated by terrace-like plateaus or "karroos," which slope northward. Of these, the Great Karroo is 300 miles from east to west, 70 miles broad, and 2,000 feet high. North of this is the range known as the Nieuwveld Berge, culminating in the Spitzkop, or Compass Berg (7,800 feet). This range is continuous north-eastward with the Storm Bergen and Drakenberg or Quathlamba Mountains, that divide the Transkei, Griqualand East, and Natal from Basutoland and the Orange Free State. South of the Great Karroo is the Great Zwarte Bergen (Black Mountains) range. Numerous mountain torrents flow in deep ravines, cañons, or "kloofs" from these plateaus; but the small and very intermittent rainfall of the interior renders them useless for irrigation or navigation, and they mostly have bars at their mouths. The Orange River, the two head-waters of which—the Nu Gariep and the Vaal—rise on the slopes of the Mont-aux-Sources (10,000 feet), in the Drakenberg, and form the southern and northern boundaries of the Orange Free State, has a fall 150 feet high and a course of about 1,000 miles—as long as the Rhine—but is only navigable by small boats for a few miles. The climate is healthy, temperature being very uniform. That at Capetown averages 74° F. in January (midsummer) and 57° in July (midwinter). The Karroos, dry deserts in summer,* rapidly become verdant pastures during the rains.

Coal is worked in the south-east to the extent of about 25,000 tons annually; salt is obtained from salt lakes, especially near Algoa Bay; and soda on the Great Karroo; but the chief mineral products are copper, of which 28,000 tons were obtained at Ookeip, in Namaqualand, and exported from Port Nolloth, in 1887; and diamonds, obtained since 1867, near Kimberley, in Griqualand West.

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* For tabular enumeration, *see* Vol. I., p. 76.

* "Karroo" is the Hottentot word for "dry" and "hard."

Among the native plants the heaths, geraniums, everlastings, stapelias, or carrion flowers, and aloes are noticeable. There are some fine forests on the mountain slopes, but few useful timbers. A native box-tree affords a wood valuable for engraving. Many of the larger animals—the elephant, rhinoceros, hippopotamus, giraffe, buffalo, antelope, zebra, gnu, lion, leopard, panther, hyena, wolf, and jackal—are now found only in the interior.

Of the population, exceeding 1¼ million, or five to the square mile, about two-thirds belong to native races, of which the Kaffirs are increasing, the degraded hunting tribes of Bushmen and the nomad stock-rearing Hottentots in the north-west decreasing. Of the remaining third the majority are Boers, descendants of the Dutch settlers of the seventeenth century, who retain their own language.

Sheep-rearing is the chief industry of the colony, 21,185 tons of wool and 2,420 tons of the hair of the Angora goat being exported in 1886. Horses and cattle are also reared; but the breeding of the ostrich, a native bird, the feathers of which to the value of half a million sterling are annually exported, is more important. Wheat, barley, and oats are grown; but the only manufacture of consequence is wine, the vine having been introduced about 200 years ago. Constantia, produced near Table Mountain, is the best. Trade is carried on mainly with the United Kingdom, the imports for 1887 being over £5,000,000 and the exports nearly £8,000,000. There are about 1,600 miles of railway in the colony, most of which is Government property, including a line to Kimberley. The Government is administered by a Governor, who is also Commander-in-Chief and High Commissioner for South Africa; an elected Legislative Council of 22, a House of Assembly of 76 members, and a responsible ministry.

The chief towns are **Capetown** [45], 5,866 miles, or 20 days, from London—with docks and a breakwater, a university, a cathedral, and an observatory—situated on Table Bay, on the west coast, under the flat-topped Table Mountain (3,580 feet); *Kimberley* [14], the centre of the West Griqualand diamond fields; *Port Elizabeth* [13], on Algoa Bay, the chief port, and *Grahamstown* [7], the chief town in the south-east; *Simonstown* [3], on Simon's Bay, just north of the Cape of Good Hope, which gives its name to the colony, with an arsenal; *Port Nolloth.* in the north-west; *King William's Town* [4], formerly capital of British Kaffraria; and *East London*, a port, in the extreme east.

GRIQUALAND WEST, lying north of the Orange River and west of the Orange Free State, was proclaimed a British colony in 1871, and annexed to Cape Colony in 1880. The River Keiskamma having been the eastern boundary of Cape Colony from 1848, BRITISH KAFFRARIA, now the EASTERN PROVINCE, east of that river, was incorporated in 1865. BASUTOLAND, to the north-east, between the Drakenberg and the Orange Free State, with an estimated area exceeding 10,200 square miles, and a population of 128,500, was annexed in 1871, and is under a Resident Commissioner. The chief town is **Maseru**.

THE TRANSKEI, from the Kei to the Natal frontier, and from the Drakenberg to the Indian Ocean, including GRIQUALAND EAST, FINGOLAND, the IDUTYWA RESERVE, GALEKALAND, TEMBULAND, the PORT OF ST. JOHN'S (purchased in 1878), and the coast of PONDOLAND, under a Protectorate, has been annexed between 1877 and 1885. The barren and only partially explored BECHUANALAND, defined as extending from Griqualand West, the Orange and Limpopo Rivers, to the parallel of 228 S. lat., and from 32° E. long. to 20° E., including an area of 184,500 square miles, with a population of 38,000, was declared under British protection in 1885. In this way the trade route, from Hopetown, on the Orange, through *Shoshong*, to the Zambesi, is kept open. The western part of the Protectorate is the Kalahari Desert. WALFISCH BAY, on the west coast just north of the Tropic of Capricorn, in Damaraland, was annexed to Cape Colony in 1884. The PENGUIN ISLANDS to the south of lat. 25° S., yielding guano, are also British.

THE TRANSVAAL, or SOUTH-AFRICAN REPUBLIC, between the Vaal and Limpopo Rivers, with an area of 112,700 square miles, and a population of 800,000, only 7 per cent. of whom are white, was founded by Boers in 1852, annexed by England in 1877, and restored in 1881, English suzerainty, represented by a Resident, being reserved. The Transvaal is mainly a healthy upland basin over 3,000 feet high. It is rich in coal, gold, copper, and iron, and diamonds occur in the south. A belt 40 miles wide along the Limpopo is infested with the tsetse fly, which is fatal to cattle. A railway has now been made from the eastern frontier to Lorenço Marquez on Delagoa Bay, which belongs to Portugal. **Pretoria** [4½] is 980 miles from Capetown, 400 from Durban.

NATAL, named *Terra Natalis*, from its discovery, by the Portuguese navigator, Vasco de Gama, on Christmas Day, 1497, was settled by Boers, who afterwards migrated to the Transvaal about 1840, and became a British colony in 1843. It lies between 29° and 31° S. lat. and 29° and 32° E. long., being of an irregular diamond shape, about 270 miles from north to south, and 170 wide, with an area of 18,755 square miles, or about one-third that of England. Its coast-line is about 180 miles long, Durban at Port Natal being the only harbour and having a bar. Its surface forms three terraces: the coast region, about 15 miles broad, almost tropical, growing sugar—the principal staple—indigo, arrowroot, and ginger, &c.; the midland area, 30 miles broad, better adapted for cereals and with good pasturage; and the slopes of the Drakenberg, rising to 3,000 or 4,000 feet, and culminating in Cathkin Peak, on the frontier of Basutoland, 10,357 feet. There are timber forests in the kloofs, and the colony is well watered. The Rivers Umzimkulu and Umtamvuna divide it from Cape Colony, the Drakenberg from Basutoland and the Orange Free State, the Tugela from Zululand, and its tributary the Buffalo from the Transvaal. Coal occurs in the north. The climate is healthy. Of the population of over 447,000, about 90 per cent. are Kaffirs, and there are a large number of Indian coolies. The chief crop is maize, known in South Africa as "meallies," and sheep and stock farming is the chief occupation in the interior. The government is administered by a Governor and an Executive, and a partially elective Legislative Council. **Pietermaritzburg** [15], about 50 miles inland from Durban, with which it is connected by a railway. *Durban*, the port, is 6,805 miles, or 27 days, from London, *viâ* Capetown.

A strip of ZULULAND, extending from the Blood, Buffalo, and Tugela Rivers to the Umhlatuzi, known since 1882 as the ZULU RESERVE, and a district along the coast, 50 to 70 miles wide, as far as St. Lucia Bay, is now administered as a British Protectorate. The rest of the country was proclaimed by the Boers in 1884 as a "NEW REPUBLIC," its capital being **Vryheid**. It may be expected that the opening of through railway routes and the influx of English colonists will lead to a South African Federation, including the ORANGE FREE STATE (capital, **Bloemfontein**) and other Boer territory.

The SUAHILI coast, from Port Wanga to Vitu, belongs to the British East African Association; from the Tana River north and east to Somaliland, including the port of *Mombasa*, is within "the sphere of British interest," and the ports of *Zeilah* and *Berbera*, on the Gulf of Aden, are now British.

SIERRA LEONE, on the west coast, extends from the mouth of the Manoh, or Manna River, the northern boundary of the negro Republic of Liberia in lat. 6° 55′ N. to the watershed between the Scarcies and Mellicoury, in 8° 30′ N., the limit of French occupancy, and for an unsurveyed distance inland. It includes also the Isles de Los and Matacong Island, farther north. The area has been estimated at 3,000 square miles, and the population, almost entirely negro, at over 60,000. The rainfall, exceeding 150 inches annually, and the temperature of about 80° F., renders the coast very unhealthy. The chief exports are palm kernels, india-rubber, kola nuts, palm oil, hides, copal, and ginger, which, with the exception of the last-named, come from the interior. The Governor has Executive and Legislative Councils. **Freetown** [22], on the north coast of the peninsula at the mouth of the Rokelle, or Sierra Leone River, is 3,000 miles, or 13 days, from London. Near it is Fourah Bay College, affiliated to the university of Durham.

GAMBIA, a settlement founded in 1588, comprises 69 square miles at the mouth of the River Gambia in lat. 13° N. and long. 17° W., with a population of 14,000. **Bathurst**, on the Island of St. Mary, exports ground-nuts, bees-wax, &c. The government is vested in an Administrator, subordinate to the Governor of Sierra Leone, and a Legislative Council.

THE GOLD COAST, comprising the coast of Upper Guinea, about lat. 5° N. from long. 2° 40′ W. to 1° 10′ E., and extending about 50 miles inland, is estimated to contain over 29,000 square miles, and a population of over 1,400,000. The climate is humid and unhealthy. The chief exports are palm oil, palm kernels, rubber, and gold dust. **Accra**, the residence of the Governor since 1876, owing to the unhealthiness of *Cape Coast Castle*, is twenty-nine days distant from London.

LAGOS, an island and port on the Slave Coast of Upper Guinea, ceded in 1861 for the suppression of the slave trade, includes the coast from Badagry in long. 2° 50′ to 4° 30′ E., and we now exercise a protectorate over the Niger delta from the Benin River to the R. del Rey, and for some distance up the Niger itself. Lagos, which exports palm oil, is under a Lieutenant-Governor.

ST. HELENA, a mountainous volcanic island, in 15° 55′ S. lat. and 5° 42′ W. long., 1,200 miles from the nearest point of Africa, is about 10 miles long and six broad. Its climate is mild, equable, and healthy; but it is now chiefly important as a calling place for vessels from the East Indies for water and provisions. St. James's Bay, on which **Jamestown** [2½] is situated, is a good harbour. The distance from London is 4,447 miles, or 14 days. There is a Governor and Executive Council of four.

From 1815 till his death in 1821 Napoleon Bonaparte was detained here.

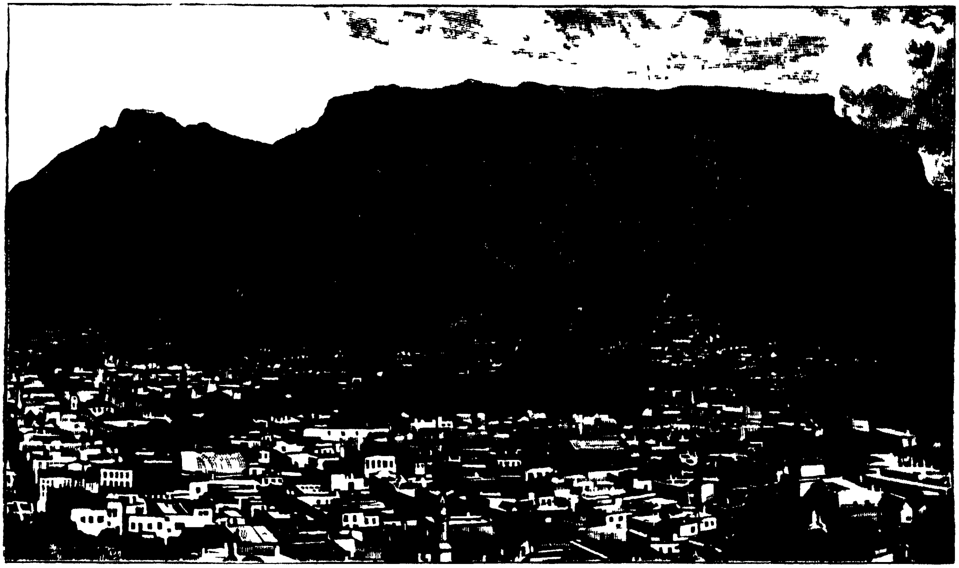

TABLE MOUNTAIN.

ASCENSION, a similar island, with a dry climate, is 760 miles from St. Helena, 900 from Africa, and 3,903 miles, or 14 days, from London, being in 7° 56′ S. lat. and 14° 25′ W. long. It is about seven miles long and six broad. It exports turtles and birds' eggs. **Georgetown** is the station of the Captain in charge under the Admiralty, the island being used as a sanatorium for the West African squadron.

TRISTAN D'ACUÑHA, INACCESSIBLE ISLAND, and the NIGHTINGALE ISLANDS, in lat. 37° 6′ S. and long 12° 2′ W., are a volcanic group, visited by seals and penguins.

AMERICAN POSSESSIONS OF GREAT BRITAIN.*

THE DOMINION OF CANADA comprises more than a third of the whole area of the British Empire. It includes the mainland of North America, with the exception of Alaska, north of the parallel of 49° N. lat. in the west; of a chain of small lakes from the Lake of the Woods eastward; of the middle line of Lakes Superior, Huron, Erie, and Ontario; and of the River St. Lawrence to 45° N.; and then of that parallel to the boundary of New Hampshire, and of an arbitrary line north-eastward to Edmundston, on the St. John's River, and south-eastward partly along that river and the St. Croix to the Bay of Fundy. It also includes Prince Edward's and Cape Breton Islands, all those to the north in the Arctic Ocean, Vancouver and Queen Charlotte Islands off the west coast; but not Newfoundland or the north coast of Labrador, Greenland (belonging for the most part to Denmark), or Prince of Wales Island and others to the north of it (belonging to the United States territory of Alaska). The boundary in the north-west, parting it from Alaska, is the meridian of 141° W. from the Arctic Ocean to Mount St. Elias, a volcano 19,500 feet high. Canada thus lies between this meridian and that of 55° 45′ W., that of York Point, Labrador, and between 41° 45′ N. lat., that of Pelée Lake Erie, and the Polar Sea. Its large as Europe, is estimated at 3½ million square miles, or more than 38 times that of Britain.

Physical Divisions, &c.—Physically Canada may be considered in five regions :—(i.) The region east of the St. Lawrence, including Nova Scotia, Prince Edward Island, New Brunswick, and part of Quebec, hilly, well wooded, with much good agricultural and pastoral land ; (ii.) the forest belt, the eastern part of which is now mainly cleared, comprising the remainder of Quebec, Ontario, and much of Keewatin and Athabasca between the fifty-fourth and fifty-ninth parallels; (iii.) the tundra region, frozen plains, including the Arctic Islands and the mainland from the Mackenzie River to Lake Athabasca, round the shores of Hudson's Bay, and throughout Labrador; (iv.) the prairie region, including Manitoba, Assiniboia, Saskatchewan, and Alberta; and (v.) the mountain region of British Columbia. The forest region is rich in pines and firs, the timber or "lumber" from which, floated down the rivers into the Ottawa and St. Lawrence and so to Quebec, is the chief staple of the east, whilst furs, obtained from bear, beaver, fox, moose, deer, otter, sable, racoon, and other animals, are the main product of its western portion. The tundra region, sloping from an elevation of more than 1,000 feet, is drained northward mainly by the Nelson, Great Fish, and Mackenzie Rivers. The barren peninsula of Labrador is cut off from the main mass of the region by the huge inland sea known as Hudson's Bay, and its southern inlet, James Bay, which extends southward almost to lat. 51° S. The prairie region, rising westward in three terraces from 700 to 3,000 feet above sea-level, and almost destitute of trees, has, especially in Manitoba and Saskatchewan, a soil of exceptional fertility, and coal is worked in Alberta, and occurs elsewhere. British Columbia, mainly the dry plateau between the Rocky Mountains and the Coast Range, is rich in minerals, especially gold, pine timber on the Coast Range, salmon in the rivers, furs from the north, and good coal on Vancouver and the Queen Charlotte Isles.

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* For tabular enumeration, *see* Vol. I., p. 76.

HUMAN PHYSIOLOGY.—IX.

[*Continued from p.* 84.]

EXCRETORY ORGANS.

There are three chief agencies by which the process of purification is effected—the *lungs*, the *skin*, and the *kidneys*. Of the first two we shall speak when we come to the subject of respiration. The kidneys (Fig. 22) are probably the most purely excretory organs of the body. They do not form any substance for future use in the system. Their office is simply to separate from the blood certain matters which would be injurious to the health if not removed. Some traces of these organs are found in even very low types of animal life, and the higher the animal is placed in the scale of creation the greater development and importance do these organs assume. In the lobster tribe the kidneys are represented by the *green glands* which exist at the bases of the larger pair of feelers; and in molluscs the *organ of Bojanus* seems to discharge the duties of an excretory apparatus. In the human subject they are two in number, and are placed deeply in the abdomen, one on each side of the vertebral column, extending from the eleventh rib to the superior margin of the haunch bone. Their shape is well known, somewhat resembling the bean which has been named after them; they are usually enclosed in the centre of a mass of fat, and are held in their position by the vessels which pass to and from them. Each is about four inches in length, two inches in breadth, and about one inch in thickness; their weight varies from four and a half to six ounces each. They are glandular bodies, composed of an immense number of minute lobes (*Malpighian bodies*), which are lined with secreting cells; these tubes converge and empty themselves into one canal or duct, called the ureter, which in turn enters the bladder. Ramifying amongst these tubes are the ultimate branches and capillary network of the renal artery, which brings to the kidney the blood loaded with effete material. This artery breaks up and submits the blood to the action of the secreting cells of the kidney, much in the same way as the portal circulation is submitted to the bile-secreting cells of the liver. The tubes, the branches of the artery, and veins are bound together by connective tissue, and the whole organ is enclosed in a capsule of the same material. At the centre of the kidney, where there is a kind of notch, the artery enters, and the vein and the duct leave the kidney. The ducts called the ureters are membranous tubes, of the size of a goose-quill, about sixteen or eighteen inches long, which convey the secreted urine into the bladder. Owing to the large size of the renal arteries and veins, the transit of the blood through the kidneys is so rapid that it is probable that the whole of the blood in its turn is purified by them. Some of the elements found in the urine exist as such in the blood, but other elements are formed by the chemical agency of the secreting cells of the kidneys.

Healthy urine is a clear limpid fluid, of a pale yellow colour, generally acid in reaction in man and all carnivorous animals, but alkaline and turbid in the herbivorous; its average specific gravity is about 1020; the average quantity secreted during the twenty-four hours is from 50 to 60 ounces; but this, as well as the specific gravity, depends very much upon the quantity of fluid taken, and also upon the activity of the skin.

Chemically, the urine consists of water holding in solution certain animal and saline matters; it contains about 33 per cent. of solid matter; but its constitution is best shown by the following table, which exhibits the quantities contained in 1,000 parts of urine:—

	Water	958
Solids.	Solids	42
	Urea	23·3
	Uric Acid	0·5
	Chloride of Sodium	11·5
	Phosphoric Acid	2·3
	Phosphates of Lime and Magnesia	0·8
	Sulphuric Acid	1·3
	Ammonia	0·4
	Free Acid	2·0

(Various other matters, hippuric acid, etc., are present in traces only.)

The quantity of water varies according to the amount of fluid drunk and exercise taken, and is strongly influenced by some mental emotions; in some diseases it is diminished, and in others enormously increased.

The largest and most important solid constituent is urea. This forms about half of the whole solid matter, and is the most important, as it is the chief substance by which the nitrogen of the used-up tissues and unutilised food is removed from the body; and also because the failure to remove it, from whatever cause it may arise, is followed by the most disastrous consequences to the health of the sufferer; every function of the body suffering, but the nervous system chiefly. Some of the most common results of the presence of urea in the blood —of *uræmic poisoning*, as it is called—are convulsions, loss of consciousness, and eventually paralysis of all nerve power, and death, resulting from the stoppage of the respiratory movements. In any disease, such as scarlet fever, in which the excretory function of the skin is for a time in abeyance, a greater amount of work is required to be done by the kidney; and it is this fact which renders any chill under such circumstances so dangerous; as in that case the work is increased still more, and is often greater than the kidney is able to perform, so the waste products and superfluous fluid accumulate in the circulation, and dropsy often supervenes.

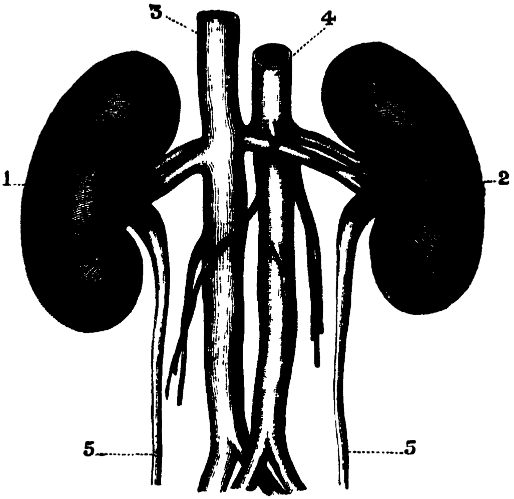

Fig 22.—Human Kidneys.
1, Right Kidney; 2, Left Kidney; 3, Vena Cava; 4, Aorta; 5, Ureters.

Uric acid is another nitrogenous compound, and is derived from the same sources as the urea, and serves, in a minor degree, the same purpose. The salts of the urine form a fourth of the solid ingredients: the sulphates are probably derived from the decomposing nitrogenous tissues; the phosphates are partly derived from bone destruction, but principally from the wear and tear of nerve substance, as they are always increased after any undue mental exertion, or any other circumstance producing nervous exhaustion. The chlorides are probably derived directly from the food taken. All these elements vary much in amount, but are all of subordinate importance to the excretion of urea.

Having now traced the blood from its origin, in the products of digestion, through the various tissues of the body, and having described one of the methods by which the worn-out materials are removed from it, we shall next consider the subject of *respiration* or *breathing*, which relieves the blood of the other impurities, and refits it to continue its unceasing work of rebuilding and maintaining the different tissues of the body.

The parts concerned in the function of respiration are the *windpipe*, or *trachea*, and the *lungs*, included in their serous sacs — the *pleuræ*. The trachea, or windpipe, is a cylindrical tube, partly membranous and partly cartilaginous, about four and a half inches in length and three-quarters of an inch in diameter, which latter is always greater in man than woman. It extends from the lower extremity of the *larynx* (the organ of voice), the upper opening of which was described as lying in front of the œsophagus (protected by the *epiglottis*), to opposite the third dorsal vertebra, where it divides into two bronchi, one for each lung. The right bronchus, wider but shorter than the left, is about an inch in length, and continues more in a straight line with the canal of the trachea than the left; from which cause, and on account of its greater width, any foreign substance introduced into the windpipe almost universally falls into the right, and not into the left, bronchus.

The left bronchus is nearly two inches in length, and enters the left lung on a lower level by nearly an inch than the right bronchus does the right lung. In structure the trachea and bronchi coincide; they are made up of cartilaginous rings—or rather half-rings, the hinder portion of the rings being absent—and membrane, which latter completes the circle, and joins the various rings together. In the trachea there are from sixteen to twenty of these incomplete rings, in the right bronchus from six to eight, and in the left from nine to twelve. The interior of the canal is lined with mucous membrane, continuous above with that of the larynx, and below with that of the lung; overlying the cartilaginous and membranous walls are some elastic tissue and muscular fibres of the organic type.

Each lung is enclosed in a membrane called the *pleura*. This is one of the serous membranes, and is consequently a shut sac, having a double layer. The inner one, which covers the surface of the lung, is called the *visceral* layer; the outer, lining the walls of the thorax, the *parietal* portion. The space between the two is the cavity of the pleura, which in the healthy state contains a small quantity of fluid, to enable the walls to glide easily on each other without friction. The two pleuræ do not communicate, but are in relation with each other, except for a short distance in front; this space between them, which contains the heart enclosed in the pericardium and the large blood-vessels, is called the *mediastinum*. The right pleural sac is shorter and wider, and extends higher into the neck than the left.

The lungs, the most important organs of respiration, are two in number, the right and the left, and occupy the corresponding lateral cavities of the chest. They are conical in shape, the smaller end of the cone being placed the highest, and extending into the root of the neck from an inch to an inch and a half above the level of the first rib. The broad base of each lung rests upon the diaphragm, and extends lower behind than in front. Each lung is composed of two parts, called the upper and the lower lobes, which are separated from each other by a fissure. In the right lung the upper lobe is partly split into two by a shorter fissure, so that the right lung is said to have three lobes, whilst the left has only two. The right lung is always the larger. It is broader than the left, in consequence of the greater divergence of the heart to the left side; but this is in some measure compensated for by its being shorter, because of the liver forcing up the diaphragm to a higher level on the right side. About the centre of the inner surface of each lung is a spot (the "root" of the lung), where the bronchus, the pulmonary artery and pulmonary vein, and nerves enter the substance of the lung; these structures, together with arteries and veins proper to the bronchus and the bronchial glands, are all enclosed in a process of the pleura, and form what is called the root of the lung.

The two lungs taken together in the adult weigh from two pounds and three-quarters to three pounds; they are heavier in the male than the female. The colour of the lung varies with the age of the individual. At birth they are of a pinkish-white; in the adult they become mottled with patches of a dark slate-colour, in consequence of the deposit of colouring matter of a carbonaceous character derived from the air; and as old age advances these patches become nearly black. The substance of the healthy lung is light and spongy, floating in water, and crackling when handled, a frothy fluid being squeezed out. In disease it often becomes solid, and is then heavier than water, and contains no air; this is one of the results of inflammation of the lungs.

We must now consider the minute structure of these curious organs. The substance proper of the lung is enclosed in a serous coat derived from the pleura, and is made up of an infinite number of small divisions called lobules, which, though closely bound together by connective tissue, are still quite distinct from each other. Each lobule is composed of a number of cells, called air-cells, clustered upon, and opening into, the terminal branches of the bronchi, or air-tubes, with the minute divisions of the blood-vessels and nerves. When the bronchus enters the lung it divides into two, and these branches repeat the process until the ultimate ones have a diameter of less than the $\frac{1}{100}$ of an inch. In the largest branches the structure remains the same as in the bronchus; they have walls, formed of tough membrane and imperfect cartilaginous rings, by which they are held open; but as they attain a greater degree of minuteness the walls consist simply of membrane. Into these smaller ones the air-cells open, and over them the pulmonary capillaries or blood-vessels spread their close network.

The air-cells vary much in form, according to the amount of pressure to which they are subjected; their walls, which are nearly in contact, are formed of very thin membrane. The size of an air-cell is from the $\frac{1}{200}$ to the $\frac{1}{70}$ of an inch in diameter; they communicate freely with each other, and are, as before stated, arranged in groups along the sides of the bronchial tubes. Outside of these cells and tubes the capillary network is so dense that the meshes are narrower than the vessels which compose them. Thus the blood is brought into the most intimate relation with the air contained in these myriads of cells, there being nothing interposed between them but the very thin walls of the cells and capillaries, and frequently this bringing the blood and air together is even more perfectly provided for, as one capillary will often have a layer of air-cells on each side of it. The cells of one lobule do not communicate with those of another, and consequently if the bronchial tube going to a lobule become stopped, the supply of air to that lobule ceases, and it is rendered useless.

The function of respiration consists of two distinct acts, called respectively *inspiration* (by which the lungs are inflated with air) and *expiration* (by which the air, after having served its purpose, is driven out of the lungs). To understand this process we must fix firmly in our minds the conditions under which it is performed. The highly elastic lungs are enclosed in the cavity of the thorax, the bony framework of which is completed in all its deficient parts by muscular structure, and the capacity of which is capable of great alteration by muscular agency. Likewise we must remember that in the healthy living body no such thing as the cavity of the thorax exists. The lungs and heart completely fill up this space, and are in close relation to its walls in every part. The result of these arrangements is that when by any means the capacity of the chest is diminished, air is driven out of the lungs. When the pressure is removed, the lungs by their elasticity expand and follow the walls of the thorax, and so create a vacuum in some of the air-cells, and the atmospheric air at once rushes in through the windpipe to fill the empty cells. During inspiration the capacity of the chest is, as a rule, increased in every direction, but the way in which this increase is obtained varies in different instances. In young children the act of inspiration is performed almost entirely by the diaphragm, or "midriff," which, descending, forces down the contents of the abdomen, and so increases the size of the chest. In the adult, in addition to the diaphragm, which still performs a large part of the work, the elevation of the ribs by the numerous muscles attached to them comes into play. As a consequence of the way in which the ribs are articulated with the spine, and their cartilages with the breastbone, making the centre of the rib the lowest point, any raising of the ribs at the same time draws them outwards, and the ends being both more or less fixed, tends to bring the ribs into nearly a straight line with the cartilages, and so, as a matter of course, enlarges in a very marked degree the capacity of the chest. This action will be at once understood if reference be made to the illustration of the thorax given in one of the earlier lessons on this subject (*see* Vol. I., p. 25). The chest and lungs during expiration resume their ordinary size by reason of their elasticity, which in deep expiration is aided by the abdominal muscles contracting and forcing up the diaphragm, which remains passive during expiration.

The quantity of air changed at each inspiration varies in different people, and this variation has been taken as a measure or index of the physical strength and constitution of the individual. Thus it has been found by experiment that a healthy man five feet seven inches in height can expire 225 cubic inches of air, and that for every additional inch of stature an increase of eight cubic inches in the capacity takes place. This rule is not much affected by the weight of the person, but age is found to modify it to a certain extent; thus the capacity increases from about the fifteenth to the thirty-fifth year, and then gradually diminishes. The number of respirations in the minute is, on an average, from fourteen to eighteen in a state of repose of body and mind; but this is liable to great variation from disease, mental emotion, or physical exertion.

The purpose of this function of respiration is to submit the blood charged with the waste material of the body to the purifying action of the air. From this contact of the blood with the air certain changes are induced in both the blood and the air; these must now be examined, and, as a preliminary, we must stop for a minute and see of what the atmospheric air is composed.

In all climates the composition of the air is practically identical, and for our present purpose it will be enough to say that it contains oxygen, nitrogen, carbonic acid, and watery vapour.

The changes which take place in the air during respiration are as follow:—First, the oxygen is diminished; secondly, the carbonic acid is increased; thirdly, the temperature is raised to about blood-heat—98·5° Fahr.; fourthly, the water is increased. Of these changes, the first two are by far the most important, and may be considered together, as one is in a great measure dependent on the other. The oxygen is diminished because it is absorbed, and enters into combination with the surplus carbon of the system to form carbonic acid: not that the whole of the oxygen absorbed is utilised in this manner—some of it, doubtless, assists in forming some of the other compounds carried out of the body by means of the skin and kidneys. The quantity of oxygen absorbed varies with different circumstances and in different individuals. Animals of a small size consume a much larger quantity in proportion to their size than larger ones. The kind of food on which an animal lives also influences the consumption; it is considerably greater on animal food than on a farinaceous diet.

The increase of the carbonic acid is mainly dependent on the absorption of oxygen, and this, therefore, is also affected by like circumstances. In an ordinary way it is calculated that a man exhales 173 grains of carbon per hour, or rather more than eight ounces in the twenty-four hours. Age and sex have some influence in this matter: thus, the amount in males regularly increases from eight to thirty years of age, and from forty to extreme old age steadily diminishes. Temperature also affects the result; the higher the temperature, the less the amount of carbonic acid exhaled.

The changes produced in the blood during respiration are manifested, first, by change of colour—the dark venous blood acquiring the bright arterial hue during its passage through the lungs; secondly, by the temperature of the blood being raised by the same process. The way in which the oxygen inspired is absorbed, and the carbonic acid expired is formed, has been much disputed. It used to be formerly held that the oxygen at once, at its entrance into the lungs, combined with the carbon contained in the blood, and thus formed the carbonic acid; but it has now been conclusively shown that though, no doubt, some of the carbonic acid is produced in this way, yet the greater part exists already in the blood by the time it reaches the lungs. The origin of this, the larger part of the carbonic acid, is thus explained:—When the venous blood is passing through the lungs it gives up the carbonic acid with which it is charged, and absorbs the oxygen, the red corpuscles being credited with the greater part of this work. The oxygen thus held in solution, and not in combination, by the aërated blood, is conveyed by the arteries to the capillary system, where it is brought into intimate relation with the elementary tissues. The oxygen assists in the nutrition of the system, and, combining with the waste carbon and other products of the worn-out structures, forms carbonic acid and water, which are conveyed by the veins back to the lungs, there to be removed from the body.

In their office of purification the lungs are powerfully assisted by the skin. From the whole surface of the body there is constantly going on an exudation of watery fluid containing many elements derived from the wasted tissue—and, notably, mineral matters. This shows how necessary for the preservation of health it is that the skin should be kept healthy and active by the free use of baths, &c., to clear away the exuded material from its surface. The skin consists of two chief layers—an outer, destitute of nerves and blood-vessels (the *epidermis*); and an inner layer, or *dermis*, well supplied with both structures. The *sweat-glands* consist of minute coiled-up tubes which open on the skin-surface by the *pores*. Into these tubes the waste matters pass from the blood-capillaries, and are in due course excreted on the skin-surface. Over 2,000,000 sweat-glands are estimated to be present in the skin. In the palm of the hand they average 3,000 to each square inch of surface. If each tube may be taken to average if uncoiled ¼ inch, then in each square inch of the palm of the hand about 73½ feet of tubes must exist. The total length of sweat-tubes in the body would amount to about 20 or even 28 miles. (Erasmus Wilson.)

HISTORIC SKETCHES, ENGLISH.–IX.

[*Continued from p.* 100.]

SIR WALTER RALEIGH.

"We had not such another head to cut off," said the people, as they returned from witnessing, in Palace Yard, the execution of one of the noblest men of the age. The age was that of James I., and the man was Sir Walter Raleigh. Never were more truthful words spoken; for of all the splendid band which had surrounded Queen Elizabeth and made the glory of her reign, the soldiers, scholars, statesmen, who upheld the queen and her religion against the power and malice of many enemies, Raleigh alone remained. "The noblest deer of all the herd" was left to be stricken by the poorest huntsman that ever rode a field. Well might Sir Walter say, as he said before his judges, that "life was wearisome to him, and all he entreated was to have leave to speak freely at his farewell, to satisfy the world that he was ever loyal to the king, and a true lover of the commonwealth." A true lover of the commonwealth he assuredly was, though not perhaps of the commonwealth as it presented itself to him under James I.; loyal to the king he was, in the sense of not endeavouring to dethrone him; that is to say, he was negatively loyal. Positively so he could not be. That he was weary of life we shall have occasion to see before we have done, though, if we may trust the report of his contemporaries, his enemies gained nothing by his death.

With some of the events of Sir Walter's life most people are more or less familiar. The story of his introducing himself to Queen Elizabeth's notice by spreading his fine cloak on the muddy ground where the queen had to pass is one of the most commonly reported. Stories of his splendid extravagance in dress, and of his other courtly qualities, are also rife, but not so well known is the history of the nobler traits in his character.

Rightly to understand the man, one ought to be acquainted to some extent with the political history of the time in which he lived. It will be sufficient for the present purpose, however, to ask our readers to realise the idea of Spain as the mightiest and most irresistible power in the world—a power ever striving to make itself felt, and lusting after universal dominion; to realise further the fact that allied with it was a power equally mighty and almost equally irresistible, which lusted after dominion over the minds and consciences of men; as the Spanish power strove for domination over their bodies. To withstand these powers combined, there were but England and the Netherlands; and while the Netherlands were powerless for aggressive purposes, and were, moreover, saturated with the blood of their own children who had died to free them from the yoke of Spain, England was to the great Spanish power as the cloud no bigger than a man's hand. Both the mighty powers had declared undying hostility to England, her people, and their religion; and the only means by which England could hope to hold her own against them, much less gain any advantage over them, was by training up and sending forth men of genius, valour, and determination, who should be possessed with something akin to a blind hatred for the two enemies, and should make war upon them, wherever they found them, striking them with mortal blows in the name of God and the Queen. These men she found among her soldiers, seamen, and statesmen—men whose fame is indissolubly bound up with the golden age of our first Protestant queen.

Second to few, if any, in the throng which included Lord Burleigh, Sir Francis Walsingham, the Earl of Essex, Sir Henry and Sir Philip Sidney, Lord Salisbury, Francis Bacon, Shakespeare, Sir Francis Drake, Sir Richard Grenville, Sir Martin Frobisher, Sir Richard Hawkins, the Earl of Leicester, and many more, was Sir Walter Raleigh, a Devonshire man, the son of good parents, and born in the year 1552. His mother was the widow of Sir Otho Gilbert, and before her marriage with him had borne the proud name of Champernoun, a family Norman among Normans. She was left a widow with three sons, all of whom became great commanders and mighty Spain-breakers. She married a second time, and Walter Raleigh was the son of her second marriage. To her teaching there is reason to think Raleigh owed that habit of God-fearing and God-loving which he never forgot, whether in the battles of Flanders, in the moments of his greatest discoveries, in the glorious success of his public career, or in the terrible hour of his death.

At the age of seventeen, after a short stay at Oxford, Walter Raleigh joined his kinsman, Henry Champernoun, who went with a hundred volunteers to help the French Huguenots against the tyranny of the League; and after serving with distinction in this business, he went as a gentleman volunteer to strike for freedom in Flanders, where the power of Spain was arrayed against the Lowlanders, who were fighting for existence. For ten years he was more or less engaged in soldiering, and then sailed with his half-brother, Humphrey Gilbert, on an expedition of discovery to the far West. The prosecution of the voyage was stopped by an engagement with some Spanish ships, which somewhat crippled the English; and Raleigh, returning home, took service with Lord Gray, who was at the time doing his best to govern Ireland in an equitable fashion. Two years' service in Ireland, and then he came to court, where his name was known, even before he took off his cloak to allow of the queen passing over the muddy ground.

Queen Elizabeth speedily took him into favour, made him captain of her body-guard, warden of the tin mines of Cornwall, gave him an estate in Ireland close to that of his friend and admirer Edmund Spenser the poet, and procured him to be returned as a member to Parliament. It is at his court-time that we hear of his extravagance in dress, of his appearing on ordinary days in a white satin pinked vest, close sleeved to the wrist; over the body a brown doublet, finely flowered, and embroidered with pearl; in the feather of his hat a large ruby, and a pearl-drop at the bottom of the sprig, in place of a button; his trunk hose, with his stockings and riband garters fringed at the end, all white, and buff shoes with white riband. After his acquisition of wealth by captures at sea, we hear of his shoes, on grand days, being worth more than £6,000, by reason of the jewels on them; of his suit of armour of solid silver; and of his sword and sword-belt studded all over with diamonds, rubies, and pearls. But Raleigh knew well enough how to dress in different style; and when occasion demanded, he could show, in all the simplicity of steel cuirass and shirt-sleeves, his easy fighting trim. Besides, he was not given wholly to vanity while at court. He studied, he wrote, he experimented in chemistry, he planned expeditions for discovering new places across the Atlantic, and he busied himself with his Parliamentary duties. For several years he remained about the queen, but took part, nevertheless, in every attack that was made upon the Spanish power. An expedition fitted out at his cost discovered and attempted to colonise Virginia. The Spanish authority was defied and injured even in its strongest hold, and received, through the exertions of Raleigh and his friends, a check which all the cowardice and folly of James I. could not counteract. In 1588 the Spanish Armada appeared off Devon and Cornwall, and Raleigh joined with Drake in having a fling at the hated foe. He quitted the soft ease of the court, his scholarly pursuits, his chemical studies, his official duties, in order that he might with his own hand make a bloody mark upon the invaders, and help the wind and the waves which fought against them.

Increased in worldly wealth, rich in knowledge and in the favour of the queen, Raleigh fell suddenly into a disgrace of which the most has been made by his detractors. He had been guilty of the high indiscretion of falling in love with Miss Throgmorton, one of the queen's maids of honour. The queen hated lovers and love-matches, and it was a serious offence in her eyes for one so near to her as Raleigh to run counter to her wishes in this matter. She was furious, and was determined to punish Raleigh. He had at the time a grand project in hand for intercepting the Spanish gold fleet on its return from the river Plate. He took time by the forelock, and hurried off to sea; but fearful lest his doing so should be misunderstood by the lady whom it most concerned, he wrote a note to Cecil, Secretary of State, explaining his conduct—a note which has been variously interpreted as indicating an intention to forsake Miss Throgmorton, and as avowing an intention not to marry anyone else. Which of the interpretations was right we may judge by the event, for after his return Raleigh honourably married the lady.

Raleigh continued at sea till recalled by Elizabeth, captured the richest prize hitherto brought into an English port, and found on his return the favour of the queen withdrawn, and an order for himself to be sent to the Tower. In the Tower he languished for several months, writing piteous, even fulsome letters, in the hope of regaining his freedom, which was granted in the autumn of the same year. Elizabeth, so long as he did not bring his wife to court, renewed the favour which had been withdrawn Raleigh resumed his place in Parliament, and strongly advocated the war with Spain. The queen gave him about this time the manor of Sherborne, and this he made it his task to cultivate. There, in the happy society of his "dear Bessie," for so he always called her, he lived a quiet life, enjoying rest and ease, and forethinking those projects of enterprise and adventure which were yet to link his name with fame.

His restless spirit could not brook retirement for long together. It drove him forth to prosecute that which had constantly occupied his mind—the search after El Dorado, and the upsetting of the Spanish power.

"It is a Sharp Medicine."

A strong sense of duty was in him to make him go forth and do this, and he went forth. The cruelties the Spaniards practised upon the poor natives, their great insatiable avarice and manifold crimes, roused a terrible indignation in Raleigh's breast. He would put a stop to this sort of thing, and perhaps discover El Dorado at the same time. He left his wife and his noble boy, he gave up the sweets of leisure and of home, and off he went upon the ocean again. The quantities of gold found by the Spaniards in Peru and Mexico gave rise to the belief that somewhere there existed a sort of fountain-head of wealth, where gold was to be had for the taking; this inexhaustible well-spring of riches was supposed by Raleigh to be situated in the country now called Venezuela, but then styled Guiana, and subsequent discoveries have proved that he was right to some extent in his supposition. Raleigh went to Guiana, made friends with the Indians, and won their affection and attachment. He told them of the queen across the sea, whose servant he was, and how she had sent him to deliver them from the cruelty of the Spaniards. In earnest of this he destroyed at Trinidad the town of San José, took the Spanish governor prisoner, and released five caciques, or chiefs, whom that wretch kept fast to one chain, and had their bodies "basted with burning bacon," in order to make them discover their gold. After many months of absence he returned to England, poorer than when he left it, because he would not enrich himself by pillage, as it was the fashion of the time to do. In spite of cold looks from those in office, he persevered in his plans against the Spaniards, and sent out Captain Keymis to succour the Indians of the Orinoco.

There was work cut out for him nearer home. The English council had resolved to burn the Spanish fleet in the harbour of Cadiz, and Lord Essex and Raleigh were sent to do it.

Terrible work there was, for Cadiz was a fortified place, and seemingly calculated by Nature to resist attacks. The Spanish fleet, well armed and manned, was lying under the protection of the forts; and on land there was a large body of the best-trained troops in the world, ready to oppose any attempt at storming. Raleigh was second in command; but he appears to have planned the attack, and to have undertaken the worst part of the execution of it. An awful fight ensued. "If any man," says Raleigh, "had a desire to see hell itself, it was there most lively figured." Amid blood, and smoke, and yells, and cheers, and the din of combat between deadly enemies, fifty-seven Spanish ships were burnt and sunk, hundreds of men went to their account, and Cadiz was stormed and sacked. Raleigh got a wound in the leg which lamed him for life, and returned to England covered with glory.

The enmity of Spain did not allow of much repose; a second expedition, this time to the Azores, was entrusted to Essex, Raleigh being second. Some disagreement arose in consequence of Raleigh having, when Essex was not forthcoming with his squadron, seized the island of Fayal and carried it unassisted. The men had not been friends, and this widened the breach between them. The general result of the expedition was a failure, and Essex tried to put the blame on Raleigh. But his honour was untouched, and for some years he lived a life of magnificence and comparative idleness in London.

With the death of Elizabeth a great change took place in the public policy of England; but before that policy could be announced, much less carried out, Raleigh cast about how he might avert it altogether. In concert with a few others, there is reason to think that he engaged in a conspiracy to place on the throne Lady Arabella Stuart, who was, according to the law regulating succession to private property, the rightful heir, instead of James I. The plot was never perhaps seriously entertained by the plotters themselves, and they certainly never took any overt steps towards executing it; but it was nevertheless discovered, and those privy to it, including Lady Arabella, were thrown into prison. Raleigh was tried and condemned upon the most inconclusive evidence, the prosecution being conducted with a vigour, not to say acrimony, most revolting.

The sentence of death was not ordered to be carried out, but was held *in terrorem* over the prisoner's head for eleven years, during which he was incarcerated in that dungeon which all are shown who visit the Tower of London. "No king but my father," said Prince Henry, the heir-apparent, "would keep such a bird in a cage." In that cage Raleigh composed his unfinished "History of the World," pursued his chemical researches, wrote letters of counsel for Prince Henry, and pondered over projects of future discovery. There, too, he had the mortification to see the Elizabethan policy towards Spain turned completely backward. The feeble monarch who sat on the English throne was completely under the Spanish influence, even to desiring, above all things, a matrimonial alliance between Prince Charles and the Spanish Infanta; everything was conceded to Spanish demands; the old English policy was dead, or seemed to be so; and the glory which had surrounded the brows of Elizabeth was departed.

Vain were the applications for relief made by

Raleigh and his friends, till the royal cupidity was excited by a golden dream which the prisoner caused to appear before it. Raleigh succeeded in convincing the court that he had reason to know the whereabouts of El Dorado. The Spanish ambassador was reassured, when he heard of the intended expedition, by the assurance of the king that no harm was meant to the Spanish possessions beyond sea; and instructions were no doubt given to Raleigh to avoid collision with the Spaniards.

As well forbid the old hunter to prick his ears and get excited at the music of the hounds as forbid the old Spanish chaser to interfere when a Spanish prey was in sight. However, there is no warrant for supposing that Raleigh meant to do anything but obey his orders. His squadron sailed, and after meeting with some disasters in the Channel, proceeded on its way, and arrived after a long voyage at Guiana and the Orinoco.

By the Indians he was received with acclamations. They remembered his former kindness to them, and how he had shielded them during his sojourn from the oppressive tyranny of their Spanish conquerors. By the Spaniards, however, he was received with jealousy and dislike; and when some of his people went to St. Thomas, a Spanish settlement on the river, a collision took place, which resulted in the destruction of St. Thomas and the loss of a number of lives. Raleigh's own son was killed, his faithful friend Captain Keymis committed suicide, and the instructions which were so particular against interference with the Spaniards were violated. Raleigh himself and many of his men were ill with fever, some of the company began to murmur, and, what for Raleigh was worse than all, gold could not be found. After another effort to discover El Dorado, Raleigh gave the order to return home, weary in spirit at his want of success and at the loss of his son George, sick in body, and his mind presaging something of the storm that was about to break upon him.

When he arrived at Plymouth he found a justification for his fears, for his wife, who met him there, told him how the Spanish ambassador had demanded satisfaction from the king, and how James was exceedingly angry. Orders awaited Raleigh to repair immediately to London, and a few miles from Plymouth he was met by Sir Lewis Stucley, who was really commissioned to take him prisoner. Arrived in London, he was sent to the Tower, from which, with some of his old companions, he tried to escape; but being betrayed was brought back, and once more lodged in the gloomy fortress.

James had written to the King of Spain—so anxious was he not to forfeit that prince's friendship—offering to put Raleigh to death, or, if Philip preferred it, he would send him to Spain to be dealt with. The letter must have made Elizabeth turn in her grave; but the Spaniard wrote back to say "that it would be more agreeable to him that the punishment of Raleigh should take place in England; and as the offence was notorious, that its chastisement should be exemplary and immediate."

Sir Walter was accordingly brought to the bar of the King's Bench, not to be tried for what he had now done, but to receive notice that execution was granted under the sentence passed on him fifteen years before. His life, being "God's high gift," he tried his utmost to guard from scathe and wrong; he used much eloquence to avert the sentence, for his wife and child's sake; but his fate was already determined, and he was ordered to suffer on the morrow.

The last night of his life was spent by the prisoner in a manner according with his antecedents. He wrote a letter to the king, and one to his wife, the latter full of the most tender solicitude for the poor lady's welfare, giving her directions what to do after his death. He wrote, also, some verses on his coming death, and then lay down to rest. Next morning the Dean of Westminster attended him, and found him smoking his favourite tobacco, and partaking of a cup of sack. His demeanour was so calm and regular that the dean chided him for levity, but afterwards confessed that he had not met a man so well prepared to die. He was cheerful in conversation, and seemed to think no more of his execution than if he had been going for a journey. His dress was carefully attended to; he would not appear slovenly for the last time.

From the scaffold he made a speech, in which he quietly explained his conduct, professed his forgiveness of those who had injured him, and asserted his loyalty to the king. He then called for the axe, and, the headsman not bringing it at once, said, "I pray thee let me see it. Dost thou think I am afraid of it?" He tried the edge with his thumb, and said to the sheriff, "It is a sharp medicine, but a sound cure for all diseases."

The headsman, when Raleigh had laid his head upon the block, asked him to lay his face towards the east. "It is no great matter which way the head stands, so the heart lies right," was the answer; and after a few moments of silent prayer the signal was given for the stroke. The executioner failed to obey immediately, and the signal being again given, the dying man called out, "Why dost thou not strike? Strike, man!"

Well might the people say, "We had not such another head to cut off."

See:—Gardiner, *History of England*, Vols. I. and II.; Raleigh *The Discovery of Guiana* (National Library, No. 67).

LATIN.—IX.

[*Continued from p.* 70.]

IRREGULAR VERBS (*continued*).

4. Nōlo, *I am unwilling.*

Chief Parts: Nōlō, nōlŭī, nollĕ.

(Notice that *nolo* stands for *ne volo.*)

INDICATIVE MOOD.

	PRESENT.	IMPERFECT.	PERFECT.
Sing.	Nōlo Non-vīs Non-vult	nōlēbam, etc.	nōlŭī, etc
Plur.	Nōlŭmŭs Non-vultis Nōlunt		

PLUPERFECT.	FUTURE.	FUTURE PERFECT.
Nōlŭĕram, etc.	[nolam*], nōlēs, etc.	nōlŭĕrō, etc.

SUBJUNCTIVE MOOD.

PRESENT.	IMPERFECT
Nōlim, etc.	nollem, etc.

PERFECT.	PLUPERFECT.
Nōlŭĕrim, etc.	nōlŭissem, etc.

IMPERATIVE MOOD.

Sing.	Nōlī, nōlītō. Nōlītō.	*Plur.*	Nōlītĕ, nōlītōtĕ. Nōluntō

INFINITIVE.

PRESENT.	PERFECT.
Nollĕ	nōlŭissĕ.

PARTICIPLE.

PRESENT.
Nōlens

5. Mālō, *I prefer.*

Chief Parts: Mālō, mālŭī, mallĕ.

(Notice that *malo* stands for *magis volo.*)

INDICATIVE MOOD.

	PRESENT.	IMPERFECT	PERFECT.
Sing.	Mālō Mavis Mavult	mālēbam, etc.	mālŭī, etc
Plur.	Malŭmŭs Mavultis Malunt		

PLUPERFECT	FUTURE.	FUTURE PERFECT.
ālŭĕram, etc.	[mālam*], mālēs, etc.	mālŭĕrō, etc.

SUBJUNCTIVE MOOD.

PRESENT.	IMPERFECT.
Mālim, etc.	mallem, etc.

PERFECT.	PLUPERFECT.
Mālŭĕrim, etc.	mālŭissem, etc.

IMPERATIVE MOOD.

(*None.*)

INFINITIVE.

PRESENT.	PERFECT.
Mallĕ	māluissĕ.

There are no participles or gerunds.

6. Fĕrō, *I carry.*

ACTIVE VOICE.

Chief Parts: Fĕrō, tŭlī, lātum, ferrĕ.

INDICATIVE MOOD.

	PRESENT.	IMPERFECT.	PERFECT.
Sing.	Fĕrō Fers Fert	fĕrēbam, etc.	tŭlī, etc.
Plur.	Fĕrimŭs Fertis Fĕrunt		

PLUPERFECT.	FUTURE.	FUTURE PERFECT.
Tŭlĕram, etc.	fĕram, etc.	tŭlĕrō, etc.

SUBJUNCTIVE MOOD.

PRESENT.	IMPERFECT.
Fĕram, etc.	ferrem, etc.

PERFECT.	PLUPERFECT.
Tŭlĕrim, etc.	tŭlissem, etc.

IMPERATIVE MOOD.

Sing.	Fer, fertō. Fertō.	*Plur.*	Fertĕ, fertōtĕ. Fĕruntō.

INFINITIVE.

PRESENT.	PERFECT.
Ferrĕ	tŭlissĕ.

PARTICIPLES.

PRESENT.	FUTURE.
Fĕrens, -entis	lātūrŭs, -a, -um.

GERUND.		SUPINE.	
N. Acc.	Fĕrendum.	*Acc.*	Lātum.
Gen.	Ferendī.	*Abl.*	Lātu.
Dat	Ferendō.		
Abl.	Ferendō.		

PASSIVE VOICE.

Chief Parts: Fĕrŏr, lātus sum, ferrī.

The passive voice of *ferre* contains only a few irregularities. The present indicative singular runs as follows: *feror, ferris, fertur.* The imperative is irregular:

Sing.	Ferrĕ, fertŏr. Fertŏr.	*Plur.*	Fĕrimĭnī. Fĕruntŏr.

The compound tenses are formed with *latus;* the imperfect subjunctive is *ferrer, ferrēris,* etc.; and the present infinitive is *ferri.* For the rest, *feror* is conjugated just as *legor.*

7. Edō, *I eat.*

Chief Parts: Ĕdō, ēdī, ēsum, ĕdĕrĕ *or* essĕ.

INDICATIVE MOOD.

	PRESENT.	IMPERFECT.	PERFECT.
Sing.	Ĕdō Edis *or* ēs Edit *or* est	ĕdēbam, etc.	ēdī, etc.
Plur.	Edimŭs Editis or estis Edunt		

PLUPERFECT.	FUTURE.	FUTURE PERFECT.
Ēdĕram, etc.	ĕdam, etc.	ēdĕrō, etc.

SUBJUNCTIVE MOOD.

PRESENT.	IMPERFECT.
Ĕdam *or* ĕdim, etc.	ĕdĕrem *or* essem, etc.

PERFECT.	PLUPERFECT.
Ēdĕrim, etc.	ēdissem, etc.

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* The first person future is never found.

IMPERATIVE MOOD.

Sing.	*Plur.*
Ĕdĕ *or* ēs, ĕdĭtō *or* estō	Ĕdĭtĕ *or* ēstĕ, ĕdĭtōtĕ *or* estōtĕ.
Edĭtō *or* estō	Eduntō.

INFINITIVE.

PRESENT.	PERFECT.	FUTURE.
Ĕdĕrĕ *or* essĕ	ēdissĕ	ēsūrus essĕ.

PARTICIPLES.

PRESENT.	FUTURE.
Ĕdens, -entis	ēsūrŭs, -a, -um.

GERUND.		SUPINE.	
N. Acc.	Ĕdendum.	*Acc.*	Ēsum.
Gen.	Edendī.	*Abl.*	Ēsū.
Dat.	Edendō.		
Abl.	Edendō.		

8. Eō, *I go.*

Chief Parts: Ĕō, īvī, ĭtum, īrĕ.

INDICATIVE MOOD.

	PRESENT.	IMPERFECT.	PERFECT.
Sing.	Ĕō	ībam, etc.	īvī *or* iī, etc.
	Īs		
	Īt		
Plur.	Īmŭs		
	Ītĭs		
	Ĕunt		

PLUPERFECT.	FUTURE.	FUTURE PERFECT.
Īvĕram *or* ieram, etc.	Ībō, ībĭs, etc	īvĕrō, etc.

SUBJUNCTIVE MOOD.

PRESENT.	IMPERFECT.
Ĕam, etc.	īrem, etc.

PERFECT.	PLUPERFECT.
Īvĕrim, etc.	īvissem, etc.

IMPERATIVE MOOD.

Sing.		*Plur.*	
	Ī, ītō.		Ītĕ, ītōtĕ.
	Ītō.		Ĕuntō.

INFINITIVE.

PRESENT.	PERFECT.	FUTURE.
Īrĕ	īvissĕ	ītūrŭs esse.

PARTICIPLES.

PRESENT.	FUTURE.
Ĭens, ĕuntĭs	ĭtūrŭs, -a, -um.

GERUND.		SUPINE.	
N. Acc.	Ĕundum	*Acc.*	Ĭtum.
Gen.	Eundī.	*Abl.*	Ĭtū.
Dat.	Eundō.		
Abl.	Eundō.		

9. **Quĕo**, *I am able*, and **nĕquĕo**, *I am unable*, as far as they are conjugated at all, resemble *ĕō.* Very few forms, however, belonging to them are found in the writings of Latin authors, the present indicative and subjunctive being most in use. Of the present indicative *queo, nequeo, nequit,* and *nequerunt* are used, as well as the present subjunctive of both verbs throughout: *queam*, etc., *nequeam*, etc.

10. **Fīo**, *I become* or *am made.* This verb is used as the passive of **făcĭō**, *I make.* Its simple tenses are, as you will notice, active in form, though passive in meaning. Its infinitive has a passive form, ***fĭĕrī;*** its compound tenses are formed with *factus*, the past participle of *facio;* and *faciendus* is its gerundive. Bearing in mind these facts you will be able to write out the compound tenses for yourself. The tenses which present any difficulty are given below.

Chief Parts: Fīō, factus sum, fīĕrī.

INDICATIVE MOOD.

	PRESENT.	IMPERFECT.	FUTURE.
Sing.	Fīō	fīēbam, etc.	fīăm, fīēs, etc.
	Fīs		
	Fīt		
Plur.	Fīmus		
	Fītis		
	Fīunt		

SUBJUNCTIVE MOOD.

PRESENT.	IMPERFECT.
Fīam, etc.	fīĕrem, etc.

IMPERATIVE MOOD.

Sing.	Fī.	*Plur.*	Fītĕ.

INFINITIVE.

Fīĕrī.

Fio, we have said, though active in form, has a passive signification. There are a few other verbs in Latin which are also *quasi-passives.* Such are— **exŭlo**, *I am banished;* **vāpŭlo**, *I am beaten;* **lĭcĕo**, *I am put up for sale;* and **vēnĕo**, *I am sold.* These verbs are generally rendered into English by passive verbs, and are regarded by grammarians as passives which have got an active form. But if we look rather more closely into their meaning we shall see that they are really neuter verbs, which naturally have an active form. Thus, *exulo* may be taken to mean *I am in exile; vapulo* may correctly, though not idiomatically, be translated *I receive a beating; liceo* means *I am for sale;* while *veneo* (= *vēnum eo*) means *I go to sale.* Thus these verbs have won their reputation as passives because, according to our idiom, they are represented in English by passives.

DEFECTIVE VERBS.

Defective verbs are those which are deficient in certain parts belonging to the model verbs. Already we have met with verbs, as *queo*, which had not all the usual parts, which we classed with *eo* on account of their resemblance to that verb. But there are some which, being specially defective, are called "the defective verbs." We must remind you that these verbs are defective, not because in the nature of things only certain of their forms are admissible, but because by some freak of usage certain forms belonging to them have never been used by writers of repute, and so have dropped out accidentally, as it were. For these "accidents" of language no explanation can be offered. We must be content to acknowledge their existence and to ascribe them vaguely to "usage."

1. Aiō, *I say "ay" or "yes," I affirm, maintain.*

Ind. Pres. Aiō, ăĭs, ăĭt, and ăiunt.
Sub. Pres. Aias, ăiat, and ăiant.
Ind. Imp Aiebam, -bās, -băt, -bāmūs, -bātĭs, -bant (no subj.).
Part. Aiens, aientis (as an adj.).

2. Inquam, *I say.*

Ind. Pres. Inquam, inquĭs, inquĭt, inquĭmŭs, inquĭtĭs, inquĭunt.
Sub. Pres. Inquĭăt.
Ind. Imp. Inquĭēbăt (no subj.).
,, *Fut* Inquĭēs and inquĭĕt.
,, *Perf.* Inquistī and inquĭt.
Imp. Inquĕ, inquĭtō, inquĭtĕ.

3. Fārī, *to speak.* Of this verb the following forms are found :—

Ind. Pres.	Fātŭr.	*Imp.*	Fārĕ.
,, *Fut.*	Fābŏr, fābĭtŭr.	*Inf.*	Fārī.
,, *Perf.*	Fātŭs est.	*Part.*	Fantem.
,, *Plup.*	Fatus éram, ĕrăt.	*Ger.*	Fandus.

4. Mĕmĭnī, mĕmĭnissĕ, *to remember* (with gen. and acc.).
Odī, ōdissē, *to hate.*
Coepī, coepissē, *to begin.*
Nōvī, nōvissĕ (nosse), *to know.*

These four forms are perfect tenses. Thus, *nōvī* is the perfect tense of *nosco.* In signification the perfect may denote the result of the act spoken of in the present, and that result may in English be expressed by another verb. Thus, as the result of inquiry is knowledge, so **novi**, the perfect of **nosco.** *I inquire into, I become acquainted with,* signifies *I know.*

These four perfects, together with the parts derived from them, are regular. Observe that the meaning of the perfect form being in English present, the meaning of the pluperfect will be imperfect, and so on.

Ind. Perf.	Mĕmĭnī, *I remember.*	Ōdī, *I hate.*	Coepī, *I begin.*	Nōvī, *I know.*
Subj. Perf.	Mĕmĭnĕrim, *I may remember.*	Ōdĕrim, *I may hate.*	Coepĕrim, *I may begin.*	Nōvérim, *I may know.*
Ind. Plup.	Mĕmĭnĕram, *I remembered.*	Ōdĕram, *I hated.*	Coepēram, *I began.*	Nōveram, *I knew.*
Subj. Plup.	Mĕmĭnissem, *I might remember.*	Ōdissem, *I might hate.*	Coepissem, *I might begin.*	Nōvissem, *I might know*
Ind. Fut.	Mĕmĭnĕrō, *I shall remember.*	Ōdĕrō, *I shall hate.*	Coepĕrō, *I shall begin.*	Nōvĕrō, *I shall know.*
Imp.	Mĕmentō, *remember thou.* Mĕmentōtĕ, *remember ye.*	*(None)* *(None.)*		
Inf. Perf.	Mĕmĭnissĕ, *to remember.*	Ōdissĕ, *to hate.*	Coepissĕ, *to begin.*	Nōvissĕ (nosse) *to know.*
Inf. Fut.	*(None.)*	Ōsūrum essĕ, *to be about to hate.*	Coeptūrum essĕ, *to be about to begin.*	*(None.)*
Part.	*(None.)*		Coeptūrŭs, *about to begin.*	*(None.)*
		Ōsŭs, *hated.*	Coeptŭs, *begun.*	(Nōtŭs)

Osus passes into the compounds **exosus** and **perosus,** *greatly hated.* Instead of *coepi, coeperam,* and so on, *coeptus sum, coeptus eram* was used when the connected infinitive was of the passive voice: as, Urbs aedificari coepta est, *the city began to be built*—that is, *they began to build the city.* The same takes place with **desino,** *I cease,* as Urbs aedificari desĭta est, *they have discontinued the building of the city.*

TRANSLATION.

The next passage we shall ask you to translate is the story of Arion, as told by Ovid in his "Fasti" (ii. 83-118). Arion was said to have been born at Lesbos, and to have played the *cithara* or lyre with such skill, that he charmed rivers, rocks, and wild beasts. The story runs that while on his way home from Sicily he was thrown overboard and saved by a dolphin :—

"Quod mare non novit, quæ nescit Ariona tellus?
  Carmine currentes ille tenebat aquas.
Sæpe, sequens agnam, lupus est hac voce retentus:
  Sæpe avidum fugiens restitit agna lupum:
Sæpe canes leporesque umbra cubuere sub una;
  Et stetit infestæ proxima cerva leæ.
Et sine lite loquax cum Palladis alite cornix
  Sedit; et accipitri juncta columba fuit.
Cynthia sæpe tuis fertur, vocalis Arion,
  Tanquam fraternis obstupuisse modis.
Nomen Arionium Siculas impleverat urbes;
  Captaque erat lyricis Ausonis ora sonis.
Inde domum repetens puppim conscendit Arion:
  Atque ita quæsitas arte ferebat opes.
Forsitan, infelix, ventos undamque timebas;
  At tibi nave tua tutius æquor erat.
Namque gubernator destricto constitit ense,
  Ceteraque armata conscia turba manu.
Quid tibi cum gladio? Dubiam rege, navita, pinum:
  Non sunt hæc digitis arma tenenda tuis.
Ille metu vacuus, 'Mortem non deprecor,' inquit;
  'Sed liceat sumpta pauca referre lyra.'
Dant veniam, ridentque moram: capit ille coronam,
  Quæ possit crines, Phœbe, decere tuos.
Induerat Tyrio bis tinctam murice pallam:
  Reddidit icta suos pollice chorda sonos.
Protinus in medias ornatus desilit undas;
  Spargitur impulsa cærula puppis aqua.
Inde (fide majus!) tergo Delphina recurvo
  Se memorant oneri supposuise novo.
Ille sedens, citharamque tenet, pretiumque vehendi
  Cantat, et æquoreas carmine mulcet aquas.
Di pia facta vident: astris Delphina recepit
  Jupiter; et stellas jussit habere novem.

NOTES.

1. *Ariona.* This is the Greek form of the accusative of Arion.
3. *Est retentus.* Perfect passive of *retineo,* a compound verb formed by prefixing *re* to *teneo.*
4. *Restitit.* Perfect of *resto,* a compound verb made up of the prefix *re* and *sto.* The perfect of the simple verb *sto* is *stetit,* which you will notice in line 6.
5. *Cubuere.* 3rd pers. plur. perfect indicative of *cubo.*
6. *Infestæ leæ.* Dative after *proxima,* "close to."
7. *Sine* is a preposition meaning *without.*

   Lite is the ablative singular of *lis,* = strife; *alite* is the ablative singular of *ales, ales* and *lis* both being nouns of the third declension.

   Palladis ales. "The bird of Pallas," is the owl. *Pallas,* also called *Minerva,* was one of the goddesses worshipped by the Greeks and Romans. She was said to have been the daughter of Jupiter. She was regarded as the goddess of wisdom, and so not inappropriately the owl was sacred to her.
8. *Accipitri.* Dative singular of *accipiter,* a noun of the third declension, governed by *juncta,* pass. partic. of *jungo.*
9. *Fertur,* pres. ind. pass. of *fero* in the sense of, "is said to," governs the inf. in next line.

   Cynthia. This is a name for Diana.
10. *Fraternis modis* = "at the strains of her brother"—*i.e.,* at Apollo's strains, Apollo being the brother of Diana. Apollo and Diana were two of the deities worshipped by the Romans. Diana was the goddess of the chase, while Apollo had music and the arts under his protection.
11. *Arionium* = "of Arion"; the adjective used for the genitive case of the noun.
12. *Capta erat.* Pluperfect passive of *capio.* Translate it "had been captivated."

    Ausonis. This is a feminine adjective meaning "Italian." It is declined according to the forms of the third declension, its genitive being *Ausonidis.*
13. *Inde* = "from that place"—*i.e.,* from Italy. Arion was on his way back from Italy to his home in Lesbos, taking with him the money which he had earned by his art.

    Quæsitas. Past participle passive of *quæro.*
16. *Nave tutius* = "more safe than the ship." *Nave* is the ablative after the comparative *tutius.*
17. *Destricto ense* = "with drawn sword." This is an example of the construction known as the ablative absolute. *Destricto* is past participle passive of *destringo.* For *constitit,* see note on line 4.
18. *Armata.* Perfect participle passive of *armo.*
19. *Quid tibi cum gladio?* Literally translated this means "What is there to you with a sword?" *i.e.,* "What have you to do with a sword?" Notice that *est* is omitted and must be supplied.

    Cetera turba = "the rest of the crew."

    Conscia = "having a knowledge of what was being done"—*i.e.,* "in the conspiracy."

    Rege. Imperative of *rego.*
20. *Tenenda.* This is the gerundive of *teneo,* having the sense of necessity or obligation, "to be held."
21. *Ille—i.e.,* Arion.

    Metu vacuus = "free from fear." *Metu* is the ablative after *vacuus,* implying "want."

    Deprecor. This, which is a deponent verb, means "to avert by praying." So that the words in the present line may be translated, "I do not pray that my life should be spared."
22. *Liceat.* The subjunctive present of *liceo* = "let it be allowed me."

    Referre = "to repeat" or "to sing."
24. *Possit.* The present subjunctive of *possum.*
25. *Induerat.* The pluperfect of *induo.* The cloak (*pallam*) twice dyed in Tyrian purple, together with the crown (*coronam*), was the proper dress of the "citharoedus,' or player on the lyre.

    Murice. The *murex* was a shell-fish, from which a purple dye, highly prized by the Romans, was extracted.
26. *Icta.* Past participle passive of *ico.*
27. *Ornatus* = "thus attired."
28. *Impulsa.* The perfect participle passive from *impello.* It agrees with *aqua.*
29. *Fide majus.* Lit. = "greater than belief"—*i.e.* "something beyond belief."

    Delphina. The Greek accusative of *delphin;* see note on line 1.
30. *Supposuisse.* Perfect infinitive of *suppono.*
31. *Pretium vehendi* = "as the price of his passage," lit. "of carrying him." *Vehendi* is the gerund of *veho.*

KEY TO TRANSLATION FROM OVID (p. 69).

They both agree to assemble the countryfolk and to build walls; there is a doubt which of the two should build the walls. "There is no need," said Romulus, "of strife. Great is the belief in birds: let us test the birds." The plan is approved. The one (Romulus) takes his stand on the rocks of the woody Palatine; the other takes his stand in the morning on the top of the Aventine. Remus sees six birds, the former sees twelve, in a line. They stand by the agreement, and Romulus has dominion over the city. A suitable day is chosen upon which he may mark out the walls with a plough. The feast of Pales was at hand; from this time the work is started. Then, holding the plough-handle, he marks out the walls with a furrow. A white cow together with a snow-white ox bore the yoke. He (Romulus) prayed, and Jupiter gave the omen with thunder on the left hand, and bolts were hurled from the left quarter of the heaven. The citizens, pleased with the augury, lay the foundations, and in a short time there was a new wall. Celer urges on this work—Celer, to whom Romulus himself had given the name. "May they be thy care, O Celer," he had said; "and let not anyone cross either the walls, or the foss made by the plough. The man daring such things do thou deliver over to death." This Remus did not know, and began to despise the lowly walls, and to say, "Will the people be safe with these?" Nor stayed he, but leapt across. (*Lit.* Nor was there delay, he leapt across.) Celer, when he dared this, attacks him with (a blow of) his spade. Covered with blood he presses the hard ground.

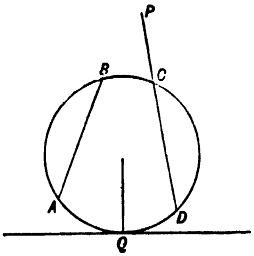
GEOMETRY.—IX.

[Continued from p. 93.]

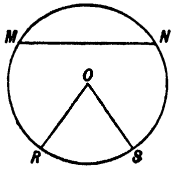
THE CIRCLE.

THE circle, as we have already intimated, may be regarded as a polygon bounded by an infinite number of infinitely small sides. The circle may, therefore, be considered next.

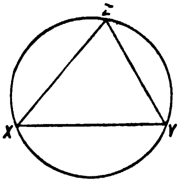
The *chord* (*i.e.,* string) of an arc (*i.e.,* bow) is the straight line passing across the circle from one extremity of that arc to the other. Thus, the straight line AB in the figure is the chord of the arc on either side of it. A *secant* (*i.e.*, cutting line) is any straight line passing from a point outside the circle across it, and forming a chord within it. Thus, PCD is a secant passing from P outside the circle and forming the chord CD. A *tangent* (*i.e.*, touching line) is any straight line in conjunction with the circle at a point of the circumference, but which (produced, if necessary) does not cut the circle. The figure shows the tangent to the circle at the point Q of the circumference. A tangent makes right angles with the radius drawn to the point of contact.



A *sector* of a circle (*i.e.*, a cutting from the circle) is any portion of the circle contained by two radii, and the arc between them. Thus, the figure shows the circle divided into two sectors, one bounded by the radii OR and OS and the shorter arc RS, the other by the same radii and the longer arc RMNS. A *segment* of a circle (also a cutting from the circle) is any portion of the circle contained by an arc and its chord. Thus, in the figure the chord MN divides the circle into two segments—the smaller one above it, and the larger one below.

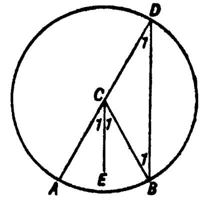


An *angle in a segment* is the angle contained by two straight lines drawn from any point in the arc of the segment to the extremities of the chord of that segment. Thus, in the figure the angle XZY is the angle in the segment XZY.

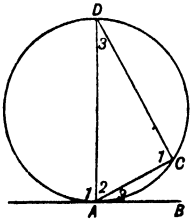


This definition implies that the angle in the same segment is of constant magnitude. In other words, that the angle XZY does not change in value although Z, the angular point, may be taken in any other position in the arc above XY. This is only another way of saying that the arc of the segment may be traced out by an angle of cardboard, equal to XZY, moving between pins at X and Y, a property of the circle with which we are already acquainted.

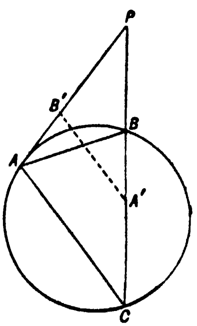
A second property of the circle is this: the angle subtended by any arc at the centre of the circle is double the angle subtended by the same arc at any point on the circumference. Let the arc AB be any arc of the circle, ACB being the angle it subtends at the centre of the circle. Produce AC to meet the circumference in D and join DB, forming the angle ADB, which is an angle at the circumference subtended by the arc AB. This angle is equal to any other angle at the circumference subtended by the arc AB, for, by shifting this angle between pins at A and B, the arc may be traced out. Draw a straight line CE of any length from C parallel to DB. Then the angles CBD and and CDB in the isosceles triangle CBD are equal, and of these equals, the former is equal to the "alternate" angle BCE and the latter to the angle ACE. Hence, the four angles marked "1" are four equal angles, and the angle ACB at the centre of the circle is double the angle ADB at the circumference.



A third important property of the circle may be given here. In the figure, BAC is the angle between a tangent and a chord drawn from the point of contact. Draw the diameter AD and join DC. The three angles of the triangle CAD are together equal to the three rectilineal angles at A, for each set is equal to two right angles. Of these angles, the two marked "1" are right angles, one of the two being the angle in a semicircle, and the other the angle made by the tangent with a diameter. The angle marked "2" is the same in both sets of angles; hence, the remaining angles—*i.e.*, those marked "3"—are equal. BAC is the angle between tangent and chord, and ADC is an angle in the alternate segment of a circle, *i.e.*, in the segment on the other side of the chord. It is equal to any other angle in the same segment. Therefore, the angle between tangent and chord is always equal to the angle in the alternate segment of the circle.

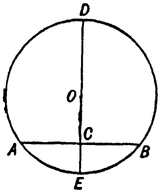


By means of the property just established, one other may be shown. P is any point without a circle; and from P a tangent is drawn, touching the circle at A, and a secant is also

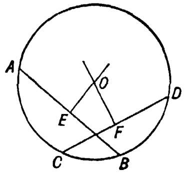


drawn from P, cutting the circle in B and C. The triangles PAB and PCA are equiangular to one another; for the angle at P is the same for both, and the tangent-chord angle PAB is equal to PCA in the alternate segment of the circle, leaving the third angle PBA of the first triangle equal to the third angle PAC of the second. The triangle PAB on being turned over into the position PB′A′ (A′ being the new position of A and B′ of B), has B′A′ parallel to AC; and the ratio of PB′ to PA′ = the ratio of PA′ : PC, or PB : PA = PA : PC, *i.e.*, the tangent PA is a mean proportional between PB and PC, the segments of the secant.

PROBLEM 103.—*To find the centre of a given circle.* Let AEBD be the given circle. Draw any chord, AB, bisect it in C, and draw DCE at right angles to AB. Bisect DE in O, and O is the centre, as required.

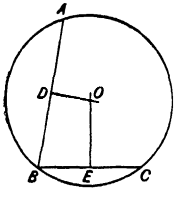


Second method.—Let ACBD be the given circle. Draw any two chords, AB and CD, and bisect them in E and F respectively. At E draw a straight line at right angles to AB, and at F a straight line at right angles to CD. The point of intersection, O, of these perpendiculars is the centre of the circle, as required.



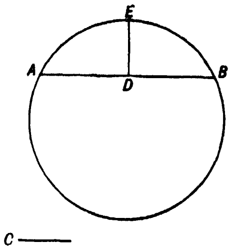
The latter method may be adopted when only an arc of a circle is given. It is, therefore, more generally useful than the former one, though not quite so simple when the complete circumference is given.

PROBLEM 104.—*Given three points, not in the same straight line, to describe the circle passing through them.* Let A, B, and C be the three given points. Join AB and BC and bisect these lines in D and E respectively. At D draw a line at right angles to AB, and at E draw a line at right angles to BC, and let these perpendiculars intersect in O. Then O is the centre of the circle, as required.

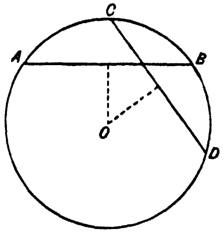


Instead of the chords AB and BC, the chords AC and BC, or the chords AB and AC might have been taken. The perpendiculars may be got without actually drawing the chords between the given points. (*See* Problem 1.)

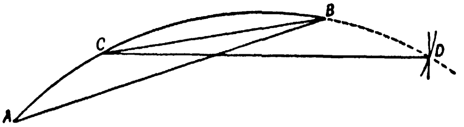
PROBLEM 105.—*On a given straight line as chord or span, to describe an arc of a circle whose height or versed sine shall be equal to another given straight line.* Let AB be the given chord or span, and C the other straight line, given to determine the height or versed sine. Bisect AB in D, and from the perpendicular at D cut off DE equal to C. The circular arc described passing through A, E, and B, is the arc required.



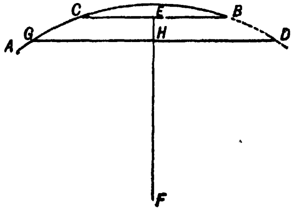
PROBLEM 106. — *To complete the circle when an arc of the circle is given.* Let ACBD be the given arc. In this arc draw any two chords, AB and CD, bisect them, erect perpendiculars at the points of bisection, and find the centre O of the required circle, as shown in problem 104. About O, with radius OA, the circle, of which ACBD is a portion, may be completely described.



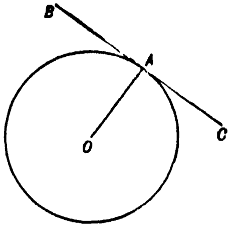
PROBLEM 107.—*To produce an arc of a circle when the centre is inaccessible.* Let AB be the given arc. In AB take any point C. About B and C as centres, with radii CA and BA respectively, describe arcs of circles cutting one another in D. Then D is a point on the curve produced. In a similar manner a number of other points on the curve produced may be obtained, and the given arc may then be produced as required by drawing with the free hand a curved line passing through them all.

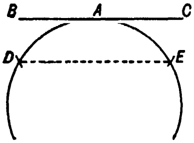


Second method.—From B draw any chord, BC. Bisect BC at E, and draw a perpendicular, EF. From any point G in the arc AC draw a perpendicular GH to EF, produce this perpendicular, and from the produced part cut off HD equal to GH, D is a point on the curve produced. In a similar manner a number of other points on the curve produced may be obtained, and the required continuation of the given arc may then be effected by the free hand, as before.



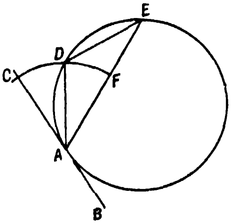
Problem 108.—*At a given point in the circumference of a circle to draw the tangent to the circle.* Let A be the given point in the circumference of the circle. Find the centre O of the circle, and draw the radius O A to the point of contact A. A straight line, B C, drawn through A at right angles to O A, is the tangent at A, as required.





Second method. — From A cut off equal arcs A D and A E, and join D E. A line drawn through A parallel to this chord is the tangent at A, as required.

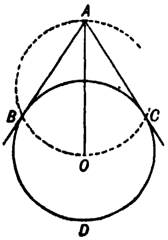
Third method.—From A cut off any two equal arcs, A D and D E. Join A E and A D. About A as centre, and with the radius A D, describe an arc of a circle passing through D and meeting A E in F. Cut off from this arc an arc D C equal to the arc D F. The straight line B C, drawn through A and C, is the tangent to the circle, as required.



The principle involved may be seen by joining D E, forming the isosceles triangle D A E, with equal sides D A and D E, and, therefore, equal angles D A E and D E A. The angle C A D—*i.e.*, the angle between the tangent and the chord A D—is made equal to the angle D A E, which is equal to the angle D E A, *i.e.*, to the angle in the alternate segment.

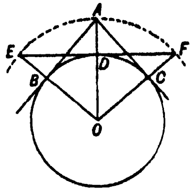
In this problem it is not necessary that the whole of the circumference should be given, a portion is sufficient.

Problem 109.—*From a given point outside a given circle to draw the two tangents to the circle.* Let A be the given point outside the given circle B C D. Find the centre O of the circle. Join A O, and on A O as diameter describe a circle, cutting the given circle in B and C. Then straight lines A B and A C are the two tangents required.



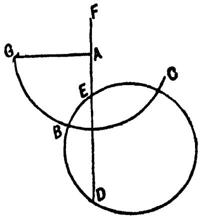
In the figure the complete circle A B O C is shown in order that it may be seen that A B O and A C O (B O and C O being joined) are angles in semicircles, and therefore right angles. It would, however, have been sufficient for the purpose of construction if arcs crossing the given circle in B and C had been described.

Second method.—Find the centre O of the circle, and join A O, intersecting the circle in D. At D draw the tangent E F, terminated at E and F by the concentric circle, of which the radius is O A. Join O E and O F, cutting the given circle in B and C respectively. Then straight lines from A through B and C are the two tangents required; for it will be observed that the triangles A B O and A C O are respectively equal to the right-angled triangles E D O and F D O, and therefore furnish the requisite right angles at B and C, the points of contact.



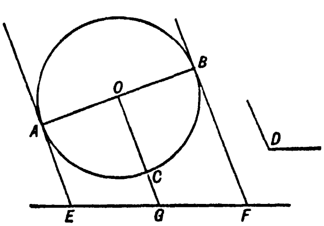
This method is not quite so simple as the first one, but is interesting, as having been in use for more than two thousand years.

Third method.—From the given point A draw any secant, cutting the circle in E and D. Produce E A to F, and cut off A F equal to A E. Find A G, the mean proportional between A F and A D, *i.e.*, between A E and A D. About A as centre, with the radius A G, describe an arc of a circle, cutting the circumference of the given circle in B and C. The straight line through A and B and the straight line through A and C are the two tangents required.



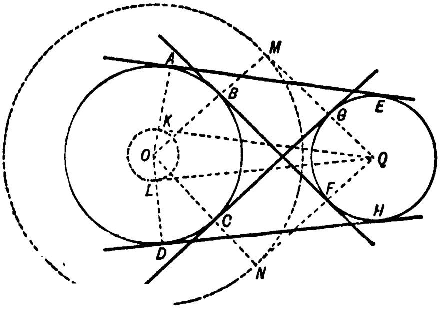
Neither method requires the complete circumference to be given; a portion of it will suffice.

Problem 110.—*To draw two tangents to a given circle, making an angle equal to a given angle with a given straight line.* Let A B C be the given circle, D the given angle, and E F the given straight line. Find the centre O. From O draw a straight line, O G, making an angle, O G F, with E F, equal to the angle D. Draw through O the diameter A B at right angles to O G. From A and B draw A E and B F parallel to O G, and meeting E F in E and F. The two straight lines through A and E, and B and F, are the tangents required.

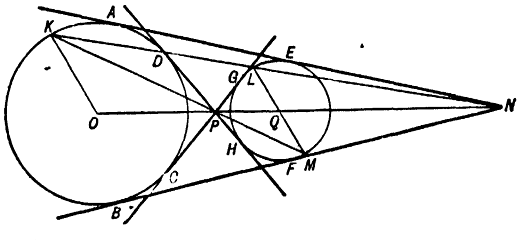


If tangents parallel to E F are wanted, the construction proceeds in the same way, the first line being drawn from the centre O parallel to E F, and, therefore, in this case not meeting it.

Problem 111.—*Given two circles, to describe their common tangents.* Let A B C be one given circle, and E G F the other. Find their centres O and Q. About the centre of the larger circle, in this example O, describe two other circles, K L and M N, one having a radius equal to the difference of the radii of the two given circles, and the other a radius equal to the sum of these radii. From the point Q draw two tangents Q K and Q L to the former, and two tangents Q M and Q N to the latter. Join O K and O L, and produce these lines to meet the circles A B C in A and D; also join O M and O N, intersecting the circle A B C in B and C. Then, A E drawn parallel to K Q, D H parallel to L Q, B F parallel to M Q, and C G parallel to N Q, are the four common tangents required.

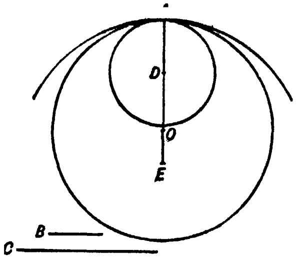


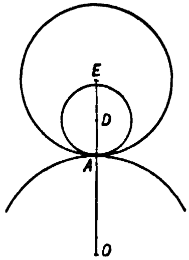
Second method.—Let A B C D and E G H F be the two given circles. Find the centres O and Q. In the first circle draw any radius O K, and in the second a parallel diameter, L Q M. Draw straight lines from K through L and M, meeting the line of centres in N and P respectively. The tangents from N and P to either circle are the common tangents to both.



Problem 112.—*At a given point on the circumference of a circle, and with a given radius, to draw a circle or arc of a circle touching the given circle at that point.* Let A be the given point on the circumference of the circle, the centre of which is O, and let B or C be the given radius. Join A O, and from A O, or A O produced, cut off A D or A E equal to B or C. About the centre D or E, with the radius D A or E A, describe an arc or circumference, touching the given circle at A, as required.

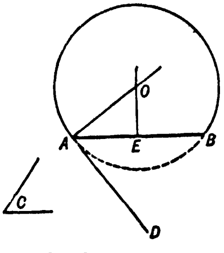
If the given radius is less than the radius of the given circle, the circular arc required falls within the given circle; and if larger, without, *i.e.*, unless the points D and E are taken on O A, produced at the end A, in which case the arc or circle required falls always outside the given circle.





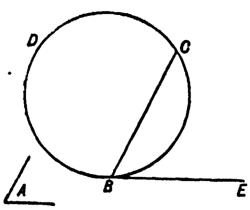
In both cases the solution is based on the fact that if two circles touch each other, whether internally or externally, the line joining their centres, produced if necessary, passes through the point of contact.

Problem 113.—*On a given straight line to describe a segment of a circle containing an angle equal to a given angle.* Let A B be the given straight line and C the given angle. At the point A in the straight line A B make an angle, B A D, equal to the given angle C. From A draw a straight line at right angles to A D, and from the middle point E of A B draw a straight line at right angles to A B. The intersection O of these perpendiculars is the centre of the circle whose segment alternate to the angle B A D is the segment required.

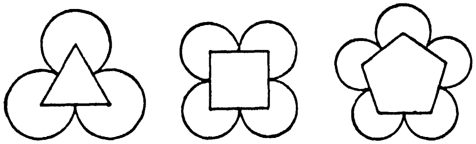


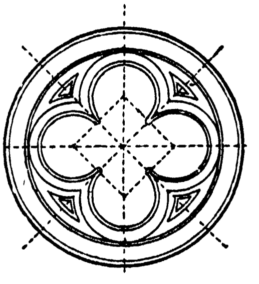
The angle between the chord and the tangent is equal to the angle in the alternate segment of the circle. We ensure A D becoming the tangent at A by taking for the centre of the circle a point in the line A O at right angles to A D; and we ensure that the circle which is to pass through A shall also pass through B, by taking for centre any point in the line O E which is drawn at right angles through the middle point of A B. By taking O, which is a point on both perpendiculars, for the centre, we ensure both that A D shall be tangent and that A B shall be a chord.

PROBLEM 114.—*To cut off a segment from a given circle, which shall contain an angle equal to a given angle.* Let A be the given angle and BCD the given circle. Draw a tangent, BE, at any point B of the circumference. At the point B in the straight line BE make the angle CBE equal to the given angle A, thus obtaining the chord BC. The segment BDC of the circle, which segment is alternate to the angle CBE, is the segment required.



PROBLEM 115.—*About a given regular rectilineal figure to describe the corresponding foiled (leaf-like) figure.* Let the equilateral triangle, square, or regular pentagon of the accompanying figure be the given rectilineal figure. About each angular point, with radius equal to half the side, describe circular arcs touching one another at the middle points of the sides. We obtain in this way the trefoil (three leaves, as in the three-leaved clover), the quatrefoil (four leaves), the cinquefoil (five leaves), and any other of the same series.





Foiled figures are much used in Gothic architecture. In the tracery of windows and the ornamentation of panels, the foliation often presents lines of great beauty.

PHYSICAL GEOGRAPHY.—IX.

[*Continued from p.* 80]

WATERS OF THE LAND (*continued*).

Glaciers.—So widespread, as we have just seen, are the evidences of the former action of ice as an agent in modifying the earth's surface, that great importance naturally attaches to its present modes of action. Above the snow-line (see lesson IV., Vol. I., p. 213) the snow is constantly consolidating by its own weight, and by melting by day and refreezing at night, into compact layers of banded white ice known as *nevé* or *firn.** This extends—sometimes with a thickness of hundreds of feet, hiding inequalities in the ground—over almost the whole of Greenland, over the Antarctic continent, and over much of the highest plateaus of our mountain systems, forming what are called *snow-fields*. Where the edges of a snow-field overhang steep slopes, masses of nevé sweep down from time to time in the temporarily destructive *avalanche*. Far more important, however, as a geological agent, is the more gradual movement of the *glacier* (Fig. 44). Pressed slowly down an incline, the white nevé becomes so flawed as to appear blue; and moving like a viscous mass, the surface and centre flowing faster than the sides and bottom, but splitting from its really brittle nature into deep fissures or *crevasses*, especially in turning corners, the glacier is, in fact, a frozen river. Its rate of flow varies greatly: the great Jakobshavn glacier travelling 63 feet in the 24 hours, the Mer de Glace from 14 to 36 inches in the same time, and the Rhone glacier only 13 inches in a year. The movement is more rapid in summer, and is no doubt largely dependent on expansion by heat, the apparent viscosity being produced by repeated fracturing and *regelation*, or reunion under pressure. The melting of the surface forms streams which pour down the crevasses, hollowing out deep pot-holes, or *giants' kettles*, and contributing to the stream, produced partly by friction, which flows beneath the glacier. Frost, acting on the sides of its upper valley, flakes off masses of rock and earth, which fall on to the glacier and form the lines of *débris* known as *lateral moraines* or *morane*. Two glaciers meeting, their inner lateral moraines unite in one line or *medial moraine*, until one such as the Mer de Glace, which has received many tributaries, appears irregularly strewn with stones brought from the upper parts of the mountains. Some of the larger of the stones stand on pedestals of ice which they have protected from the sun. These are called *glacier-tables*. Many of the stones of the moraines are washed down the crevasses, and are either frozen into the lower surface of the ice to act as teeth in a rasp, planing and scoring the rocky channel, or are themselves scratched or ground down, contributing to the turbidity of the stream beneath. Glaciers descend far below the snow-line—to altitudes, in fact, having temperatures of 40° to even 45° Fahr. Thus, in Thibet they reach 9,100 feet, in the Alps 3,400 feet, in Norway 1,200 feet, and in New Zealand 650 feet above sea-level.

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* Most terms used in speaking of glaciers, being of Swiss origin, are in duplicate, French and German, from different cantons.

In Greenland they descend to the sea-level, widening out to several thousand yards, and detaching huge masses of ice, or *icebergs*. Where the glacier does not reach the sea there is at its foot a mass of angular stones—which have not been ground down nor carried away by the river that issues from the ice—known as the *terminal moraine*. The Rhone, the Rhine, the Ganges, and all other rivers which originate in glaciers, are, unless filtered by lakes, extremely muddy, and the solid particles they thus carry in suspension aid considerably in the erosion of their banks.

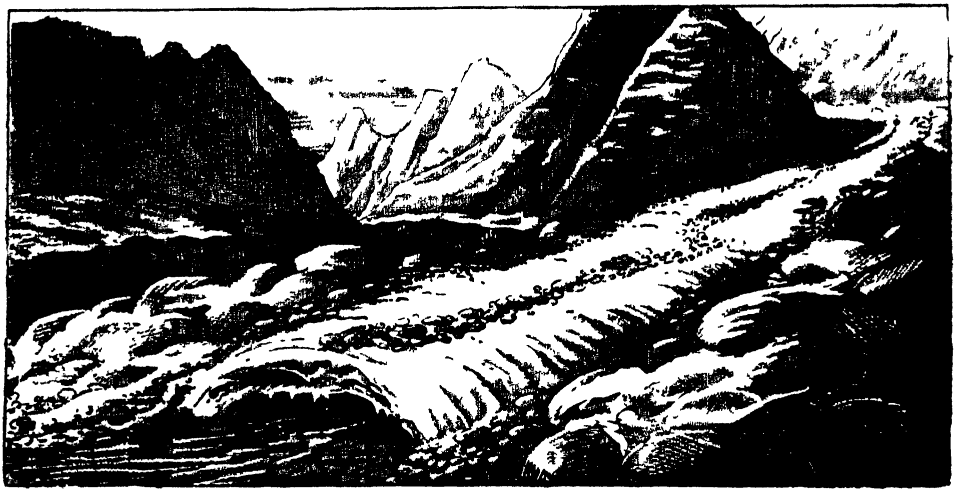

Fig. 44.—A Glacier: showing Moraines, Roches Moutonnees, etc.

Fluctuations in the mean annual temperature cause the glacier to advance lower down, or to retreat higher up, its valley; and in the latter case it exposes its rocky bed, planed and polished into rounded hummocks of rock, deeply scored longitudinally and less deeply in other directions, scooped out into giants' kettles by stones whirled round by the waterfalls of the crevasses, strewn with stones and earth known as the *moraine profonde*, or *grund-morane*, and leaving large blocks of stone balanced high up on the slopes of the valley. The rounded hummocks of rock are called *roches moutonnées*, since their polished surfaces, bare of soil, project like grey sheep from the grass-grown slopes of once-glaciated mountains. The stranded blocks of stone often brought from a distance, occurring, for instance, on the slopes of the Jura, having been carried across the broad plain that separates that range from the Alps, are known as *erratics*, or *blocs perchés*. Such scorings, or *striæ*, in the solid rock, roches moutonnées, giants' kettles, erratics, and moraine accumulations, clearly indicate former glaciation in the British Isles and elsewhere; but it is sometimes difficult to separate the action of land-ice from that of sea-ice.

Icebergs, &c.—The *floe-ice*,* formed by the freezing of polar seas, breaking up into *pack-ice*, and still more the *ice-foot*, forming along the coast, gives rise to more or less tabular bergs, floating like other icebergs with only about one-ninth of their bulk above the surface, carrying earth and stones, capsizing on being partially melted, so as to present an irregular surface, running aground and ploughing up the shore, and forming submarine banks of mud like that off Newfoundland. The huge tabular bergs of Antarctic seas are detached from the stratified *ice-cap* of the Antarctic Continent. Banks of gravel spreading for miles across Scotland, where they are called *kames*, Scandinavia, where they are known as *eskars*, and North America, may be the terminal moraines of an ice-cap The *drift*, or *boulder-clay* (the *till* of Scotland)—clays and sands filled with *boulders* or fragments of other rocks—which occurs over much of the British Isles, resembles the mud of an Arctic sea more than the moraine of a glacier.

CLIMATE AND DISTRIBUTION OF PLANTS AND ANIMALS.

Climate.—We have seen in previous lessons, especially in lessons III. and IV., how different parts of the earth's surface vary in the temperature

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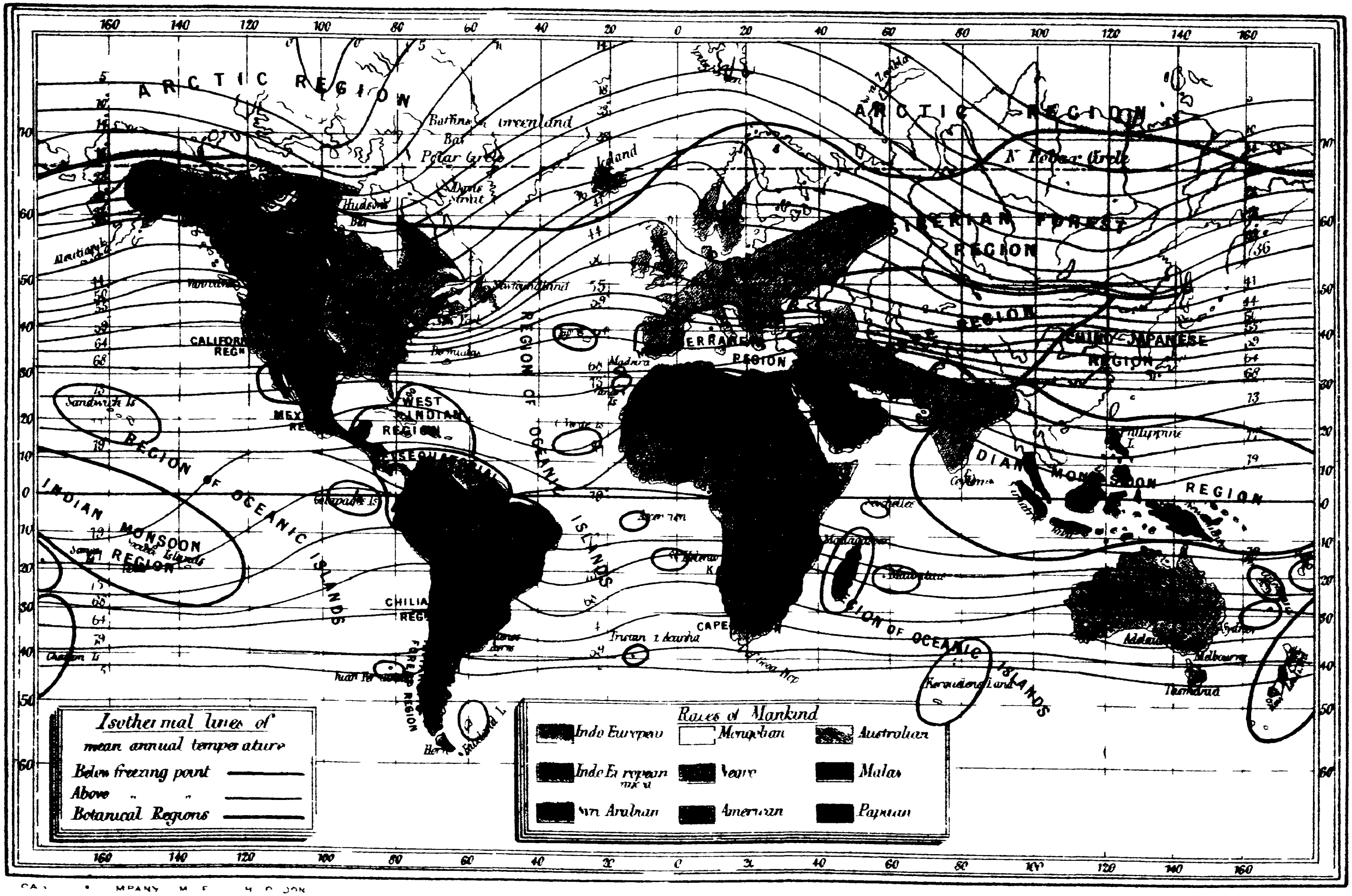
* *Floe* is a Scandinavian word meaning "field."



MAP OF THE WORLD, SHOWING ISOTHERMAL LINES, AND THE DISTRIBUTION OF RACES AND VEGETATION

and in the degree of moisture in the air. These are main factors in what is termed *climate*. Climate has been defined as the sum-total of the atmospheric conditions that influence animal and vegetable life. It therefore includes not only the temperature and moisture of the air, but also such conditions as the intensity of the sun's light, the reflection from the soil, the force and direction of the wind. We may recognise the following as the chief determining causes of differences in climate: (i.) distance from the Equator, or latitude; (ii.) distance from the sea; (iii.) altitude, or height above sea-level; (iv.) the magnitude, direction, and temperature of the nearest great marine current; (v.) the force, constancy, and direction of the prevailing winds; and (vi.) such local influences as the colour and character of the soil, the proximity of lakes, forests, or mountains.

The Effect of Latitude.—Latitude produces (*see* lesson III., Vol. I., p. 144) the varying obliquity of the sun's rays and the consequent variation in the total amount of heat received directly by any place from the sun in the course of a year. In other words, places nearer to the poles receive any given quantity of heat in a longer time than those nearer to the Equator. This not only has, as we shall see, a marked effect upon the character of the plants and animals of various latitudes, or rather of various isothermal zones, but affects also the habit of growth in widely distributed types. Many plants, for instance, will grow under widely differing conditions, provided they receive the total amount of heat they require. Wheat ripens in Northern India within three months of its being sown; in Palestine within five months; in Malta and Sicily within six; in North Italy within seven; in Central Europe and the south of England within nine; in Yorkshire, or high among the Alps, within eleven; and in Scotland only after a year's growth. So, too, the elm comes into leaf at Naples early in February; at Paris late in March; and in England in the middle of April; whilst fruit which is ripe at the first-named station in May is nearly two months later at the second, and nearly three months later with us. The rhododendron group, to take another instance, is represented in a wild state in the Himálayas by large trees; at Gibraltar and in the Alps by bushes; and in the mountains of Northern Europe by stunted shrubs.

Floras and Faunas.—The plants and animals of any region of the earth, or of any one period of geological time, are spoken of collectively as the *flora* and the *fauna* respectively of that region or period; and it is owing mainly to differences in temperature that there are distinct characteristics, or *facies* (Latin, *facies*, a face or appearance) in the floras and faunas of tropical, temperate, arctic, and polar zones.

The Tropical Region.—Thus we have the region of the tropics, characterised by elephants, camels, giraffes, crocodiles, large serpents, birds of brilliant plumage, and large and bright-coloured butterflies. This region may be subdivided botanically into the three zones known as equatorial, tropical, and sub-tropical. The equatorial zone, or zone of palms and bananas, has a luxuriant vegetation. The grasses are represented by the tree-like bamboos; and the branches of the gigantic evergreen trees are festooned with rope-like climbers, or *lianas*, such as bignonia, or with orchids which are *epiphytic*, or derive their nourishment from atmospheric moisture. The tropical zone, or zone of tree-ferns and figs, includes the regions of the peppers, aroids, and orchids of India, the tree-like nettles of the South Pacific, and the valuable cinchonas of the Andes. The sub-tropical zone, or zone of myrtles and laurels—trees with thick shining leaves—is characterised also by camellias, including the tea-plant, magnolias, acacias, heaths, and evergreen oaks.

The Temperate Region.—So, too, the temperate region, with both its plants and animals less gaily coloured, and having for its more characteristic animals the bear, wolf, fox, badger, rat, mouse, and the singing birds, is subdivided into three zones—the warm temperate, cold temperate, and sub-arctic. The warm temperate zone is that of evergreen trees, among which laurels still occur abundantly, and of the grape-vine. The cold temperate zone is that of deciduous trees—trees, that is, whose boughs are bare of leaves during the winter. Oaks, elms, beeches, maples, and poplars, and the apple are among the most characteristic types; and extensive pastures or grass-meadows, heath-covered moors, and alder-swamps form striking features in the landscape. The sub-arctic zone is that of the needle-leaved pines, represented mainly in the Northern hemisphere, where it forms a great forest belt across both the Old and New Worlds. With the pines, spruces, and larches we have here also the birch, alders, and willows, and extensive heaths, as in the northern parts of the cold temperate zone.

The Arctic Region.—Within the arctic and polar regions life becomes much less abundant and less varied. Seals, walruses, and whales occur in the seas; numerous sea-fowl and various birds with white winter plumage, such as the ptarmigan and snow-bunting, on land; together with the polar bear, white fox, reindeer, and ermine. Trees gradually disappear northward, stunted birches and willows extending into the highest latitudes of any; and these giving place to a few flowering plants such as gentians and saxifrages, and ultimately to mosses and lichens.

The Effect of Distance from Sea.—Distance from the sea affects climate by diminishing the rainfall, and permitting that greater contrast between summer heat and winter cold which characterises *continental* as distinguished from *insular* climates. (*See* lesson III., Vol. I., p. 145.) The proximity of the sea, or of any large body of water, moderates extremes of climate. Water absorbs more heat than land, and retains it longer. Thus the sea and its shores are cooler in summer and warmer in winter than more inland districts. The coast has also, owing to precipitation of evaporated sea-water, a higher rainfall than the interior. (*See* lesson IV., Vol. I., p. 211.) The effect of an insular climate upon vegetation is well exemplified by such evergreens as the Portugal laurel, laurustinus, and aucuba, which flourish in the north of Scotland, but cannot withstand the winter cold of Lyons.

The Effect of Altitude.—Height above the sea influences temperature just as latitude does, the thermometer falling about 1° Fahr. for every 300 feet of ascent. Thus in passing from the base of a mountain within the tropics to its snow-capped summit we traverse successive zones of vegetation similar to the eight latitudinal zones just described as intervening between the Equator and either pole. The zone of palms and bananas extends, near the Equator, to an altitude of about 2,000 feet; that of tree-ferns and figs to about 4,500 feet; that of myrtles and laurels to 6,600 feet; that of evergreen trees to 9,000 feet; that of deciduous trees to 10,000 feet; that of conifers to 13,000 feet; and the arctic zone of rhododendrons and azaleas to 15,600 feet. Above this, the alpine zone of herbs extends to the snow-line. It must be remembered, however, that in higher latitudes higher zones than that of palms and bananas will occur at the sea-level, and the others will be reached at proportionately lower altitudes. The analogy between altitude and latitude is, moreover, not complete, since in high latitudes we have not only less heat, but also less light. The effect of this difference is exemplified by the diminution in size of allied plants, such as the rhododendrons already mentioned, when occurring in corresponding zones of altitude in higher latitudes.

The Effect of Ocean Currents.—Ocean currents will obviously affect the climate of adjacent lands. A warm current flowing pole-wards will not only raise the temperature of the air in contact with it, as a cold current would lower it, but, evaporating freely, will also add to the moisture of the air. Thus the Gulf Stream is said to carry into the north temperate zone $\frac{1}{13}$ of the entire heat received by the torrid zone from the sun. The influence of this stream is traceable as far as Spitzbergen; it contributes to the warm and moist climates of the Bermudas, of the Azores, and of Ireland; and is calculated to raise the mean annual temperature of Western Europe at least 10° Fahr.

The Effect of Winds.—This influence of ocean currents is conveyed by the wind passing over them, and this is only one of several ways in which the direction and constancy of prevailing winds affect climate. Winds from the sea are usually moist, those from the land are usually dry. Winds from lower latitudes—*i.e.*, from warmer regions—have their moisture condensed, and are, therefore, rainy; those from higher colder latitudes are dry.

The Effects of Soil, &c.—Even such an apparently insignificant matter as the colour of the soil has its effect upon climate. Light-coloured soils, such as the glaring sands of the desert, reflect much light and heat, whilst dark leaf-mould will absorb both. Marsh lands and forests both absorb the sun's heat, and so lower the temperature of the air. It is estimated that the mean annual temperature of England has been raised 2° Fahr. during the last hundred years by the drainage of the soil.

Migration and Transport.—Climate is not, however, the sole determining cause in the distribution of plants and animals, or we should find particular kinds wherever the climate is suited for them. Instead of this we find distant countries with similar climates having widely differing floras and faunas, and we sometimes find plants and animals to flourish better in some new country than in their native lands. The present distribution is the result of the origin of new types of structure in various localities known as *generic* and *specific centres*, and their migration and transport from those centres, both under past and present arrangements of land and water, this migration being accompanied by adaptive modifications of structure.

Means of Transport.—Seeds are carried by the wind, being often winged, or tufted with parachutes of hair, to facilitate such transport. They may float for days uninjured in the waters of an ocean-current; they may be carried in the fur of animals or in mud on the web-feet of migratory birds, or undigested in their crops, which may be torn open by hawks. One accidental introduction of a new plant or animal, it must be remembered, may serve to establish it in a new region. Polar bears have been carried long distances on icebergs; monkeys, tigers, and lizards on rafts of fallen trees floating down great rivers to the ocean; and in continental areas the migratory instinct has been observed in bisons, beavers, squirrels, and lemmings, as in the more familiar cases of such birds as the swallows and cuckoos. Climatic and food requirements, snow-covered mountain-ridges, wide deserts, oceans, or even great rivers, and the keenness of the struggle for existence—for food, light, and air, that is—with plants or animals already on the spot, constitute the chief barriers against indefinite migration. It was suggested by Buffon (1707–1788) that the polar regions of the earth must have been the first to cool, and that life may therefore have made its first appearance there, and have spread towards the Equator in successive waves of migration. Similarly the torrid zone must always have been a great barrier against the migration of forms adapted for temperate climates. This could, however, be traversed, especially during the cold of the Glacial period, along the higher levels of mountain chains running north and south.

The Zoological Regions.—Zoologists have generalised the facts of the existing distribution of animals by dividing the land into six regions :—

1. The *Palæarctic*, or northern part of the Old World, including Europe, Africa north of the Sahara, Northern Arabia, and Asia except that part from the valley of the Indus and the Himálayas eastward and southward.
2. The *Ethiopian*, including Arabia and Africa from about the Tropic of Cancer southward, and Madagascar.
3. The *Oriental*, or Indian Monsoon region, including India, Southern China, Further India, the Philippines, Borneo, Sumatra, and Java.
4. The *Australian*, including New Zealand, Tasmania, Australia, New Guinea, Celebes, and the islands east of *Wallace's line*—a line drawn along the deep but narrow strait between Bali and Lombok.
5. The *Neo-tropical*, or mainly tropical part of the New World, including South and Central America, Mexico, and the West Indies.
6. The *Nearctic*, including temperate and arctic North America. Greenland may belong rather to Europe.

These regions seem to be of considerable geological antiquity, as gigantic representatives of the same groups of animals that now live in them are found in a fossil state.

Characteristic Animals.—The polar bear, reindeer, and ptarmigan, in the north; the buffalo, brown bear, house-sparrow, and, in the south, the camel, characterise the Palæarctic region. The Ethiopian region is that of the gorilla, chimpanzee, baboon, lemurs, lion, zebra, hippopotamus, giraffe, African elephant, and ostrich; and the Oriental, that of the ourang-utan, tiger, jackal, Indian elephant, long-tailed parrots, peacock, and cobra. The Australian region is characterised by the kangaroos and the monotremes, including the echidna and the duck-mole, by the birds-of-paradise, lyre-birds, paroquets and cassowaries. Jaguars, marmoset monkeys, vampire bats, sloths, armadilloes, opossums, llamas, peccaries, condors, toucans, macaws, humming-birds, and the boa-constrictor characterise the Neo-tropical region; and the Nearctic is that of the moose, glutton, skunk, grizzly bear, puma, and rattlesnake.

Botanical Regions.—Various attempts have been made to group the plants of the world geographically into regions more natural than the zones of temperature already mentioned. Bentham made three main divisions—*Northern*, *Tropical*, and *Southern*. The *Northern*, characterised by its needle-leaved pines and firs, catkin-bearing and deciduous forest-trees, and by the cultivation of cereals, wheat, barley, oats, and maize, is subdivided into three floras; the *Arctic-alpine*, including saxifrages, gentians, cranberries, rhododendrons, and primroses, amongst other types; the *Temperate*, including the trees already mentioned, numerous *Compositæ*, such as asters, in America, and *Umbelliferæ*, such as giant-parsnips, in Siberia, and marked by the cultivation of the apple and potato; and the *Mediterraneo-Caucasian*, a flora largely evergreen, including myrtles, laurels, evergreen oaks, a fan-palm, and the cultivation of almonds, olives, figs, grapes, and oranges. The *Tropical*, characterised by large evergreen trees, palms, and bamboos, includes the *Indo-Malayan*, corresponding to the Oriental region of zoologists, that of ginger, rice, mangoes, tea, and teak; the *Tropical African*, that of the date and oil-palms, the baobabs, and the spinous euphorbias; and the *Tropical American*, that of the ivory-palm, rosewood, caoutchouc, and mahogany. The *Southern* includes several scattered floras, of which the more interesting are the *Australian*, characterised by gum-trees, acacias, and the heath-like epacris; the *South African*, with pelargoniums, heaths, everlastings, and carrion-scented stapelias; and the *Andine*, represented from Tasmania and New Zealand into the west of North America.

The very distinct varieties of human beings, known as races, have apparently spread from various centres, and even after extensive migrations can be assigned to definitely circumscribed geographical areas. This will be more fully dealt with in another course of lessons, but may be mentioned here as illustrating that general application of natural laws to which we referred at the outset.

ARITHMETIC.—IX.

[*Continued from p.* 114.]

MEASURES OF SURFACE OR SUPERFICIES.

6. *Definition.*—A square is a four-sided figure of which the sides are equal and the angles right angles.

Surfaces are measured by means of *square* inches, *square* feet, *square* yards, etc., *i.e.*, by squares the sides of which are respectively 1 inch, 1 foot, 1 yard in length, etc.

7. *To find the magnitude of a Square, the length of its side being given.*

Raise the number expressing the number of linear units (inches or feet, etc.) in the side to the second power. This will give the number of square units of the same kind in the square.

For instance, a square of which the side is 4 inches contains 16 square inches; a square of which the side is 5 feet contains 25 square feet. The truth of this will appear from the following diagram:—

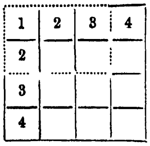


Fig. 1.

Draw a square, each of the sides of which suppose to be 4 inches long; divide the sides into lengths of 1 inch, and complete the figure by drawing parallel lines, as in the margin. This divides the square into small squares, each of whose sides is an inch in length. Now, in any one row, such as we have indicated by the figures, there are 4 such squares, and there are 4 rows. Hence, there are 16 square inches in the given square.

Suppose that two opposite sides be lengthened to 6 inches, so that the figure is no longer a square, but a *rectangle.* Dividing the figure as before into square inches, we see that there are necessarily *six* rows, each containing 4 square inches. Hence, the number of square inches in a rectangle, two of whose sides are 4 inches long, and the other two 6 inches, is 6 × 4, or 24 square inches. The same method is evidently true for any other rectangle, so that to obtain the number of square units in any rectangle we must multiply the number expressing the number of linear units in the length by the number expressing the number of linear units in the breadth.

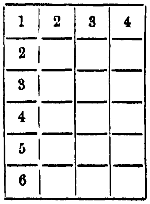


Fig. 2.

The same is true if the lengths of the sides be fractional parts of the unit of length. For instance, to find the area of a rectangle ¾ of a foot long and ½ a foot wide. Referring back to Fig. 1, suppose now that it is a square, each side of which is 1 foot. Then, dividing, as in the figure, each foot into 4 parts, the square contains 16 square parts, each of which, therefore, is $\frac{1}{16}$ of a square foot. Now the dotted line encloses a rectangle, one side of which is ¾ and the other $\frac{2}{4}$ or ½ of a foot, and this rectangle contains 6 of the 16 parts into which the square is divided; or the area of $\frac{6}{16}$ of a square foot, *i.e.*, ¾ multiplied by ½ of a square foot.

Obs.—It must be observed that, in multiplying together the numbers, fractional or otherwise, which express the number of units in the sides of a rectangle, only *one* denomination must be used. The fact is, that we cannot talk of *multiplying* two geometrical magnitudes together. We cannot, for example, talk of *multiplying* 3 feet by an inch, or by 2 feet; but we can multiply two *numbers* together which indicate the lengths of the two lines, with reference to some one standard unit, and then deduce the geometrical result which corresponds to the numerical result thus obtained.

8. The following table of Square Measure is by the above principle deduced from that of the Measures of Length. The learner is recommended to do this for himself.

SQUARE MEASURE.

144	square inches (sq. in.)	=	1 square foot	written	1 sq. ft.
9	square feet	=	1 square yard	,,	1 sq. yd.
30¼ 272¼	square yards, or square feet	=	1 square rod, perch, or pole	,,	1 sq. p.
40	square perches	=	1 rood	,,	1 rd.
4	roods	=	1 acre	,,	1 ac.
640	acres	=	1 square mile	,,	1 sq. m.

The acre contains, as will be found by calculation, 10 square chains, or 100,000 square links, or 4,840 square yards.

Flooring, roofing, plastering, etc., are often calculated by a "square" of 100 square feet.

A *hide* of land is 100 acres.

MEASURES OF SOLIDITY OR VOLUME—CUBIC MEASURE.

9. *Definitions.* — A solid figure is that which has length, breadth, and thickness. A *cube* is a solid contained by six squares, of which every opposite two are parallel. The sides of the squares are called the *edges* of the cube.

All solids, or spaces which could be filled by solids, are measured by means of the number of *cubic inches, cubic feet,* etc., which they contain —*i.e.*, by cubes, the edges of which are respectively 1 inch, 1 foot, etc., in length.

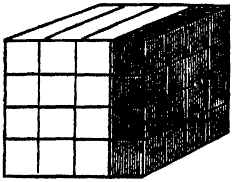
The magnitude of any solid figure is sometimes called its *volume.*

10. *To find the magnitude of a Cube, the length of an edge being given.*

Raise the number expressing the number of linear units in the edge to the third power. This will give the number of cubic units of the same kind in the given cube.

For instance, a cube of which the edge is 4 inches long contains 64 cubic inches; a cube of which the edge is 5 feet long contains 125 cubic feet.

The truth of this will appear from the following diagram:—



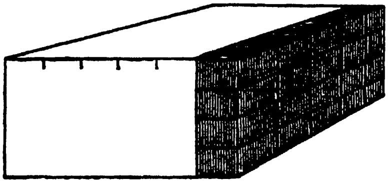
Take a cube, as in the diagram, of which the edge is supposed to be 4 inches long, and divide each edge into lengths of one inch. Then, by drawing parallel planes, as indicated in the figure, we can divide the cube into a number of cubes, each of which is a cubic inch. Now, any one slice such as that which is shaded clearly contains 4 × 4, or 16 cubic inches, and there are 4 such slices. Hence the cube contains 4 × 4 × 4, or 64 cubic inches.

11. *Definitions.*—A rectangular *parallelopiped* is a solid figure contained by six rectangular figures, of which every opposite two are parallel.

This differs from a cube in the fact that the length, breadth, and thickness are not equal.

The volume of (*i.e.*, the number of cubic units in) a parallelopiped is obtained by multiplying the numbers together which express the number of linear units in the length, breadth, and thickness respectively.

This will perhaps be sufficiently apparent from the accompanying diagram of a rectangular parallelopiped, of which the length, breadth, and height are supposed to be 6, 5, 4 inches respectively.



There will evidently be six such slices as that we have shaded, each containing 5 × 4, or 20 cubic inches.

The volume of the solid will therefore be 6 × 5 × 4, or 120 cubic inches.

CUBIC MEASURE.

1728 cubic inches = 1 cubic foot, written 1 c. ft.
27 cubic feet = 1 cubic yard „ 1 c yd.

This measure is used in estimating the magnitude of timber, stone, boxes of goods, the capacity of rooms, ships, the solid mass of earth in railway cuttings, etc. For example:—

42 cubic feet are defined to be one ton of shipping; 40 cubic feet of rough timber, or 50 cubic feet of hewn or squared timber = 1 ton or load; 108 cubic feet = 1 stack of wood; 128 cubic feet = 1 cord of wood.

For liquids and dry commodities other systems are adopted, which we will give after we have explained the measures of weight.

THE MEASURES OF WEIGHT.

12. The smallest weight in use is called a grain, and by Act of Parliament is defined in the following manner:—A vessel, of which the capacity is a cubic inch, when filled with distilled water at a temperature of 62° (Fahrenheit's thermometer), has its weight increased by 252·458 grains. Of the grains thus determined, 7,000 are a *pound Avoirdupois*, and 5,760 a *pound Troy*.

TROY WEIGHT.

13. The derivation of the word *Troy* is doubtful. One theory is that it comes from the town Troyes, in France, because the pound Troy is said to have been first used there. Another derivation is "Troynovant," the prehistoric name of London. A third derives it from *trois* (three), because it is the money weight, and that money and money weight have each *three* denominations—penny, shilling, pound; pennyweight, ounce, pound. Troy weight is used in weighing gold, silver, precious stones, etc., and also in scientific investigations.* The *fineness* of gold—that is, the ratio of the weight of pure gold in any given mass to the weight of the whole—is generally estimated by the number of *carats* (about $3\frac{1}{6}$ grains) of pure gold contained in 24 carats of the given substance. *Standard* gold—that is, the gold of our coinage—is "22 carats fine." This means that out of 24 carats of sovereign gold 22 are pure gold. Sometimes this is also expressed by saying that standard gold is $\frac{11}{12}$ fine, this being the ratio of the pure to the alloyed metal. Diamonds and other precious stones are weighed by carats.

The following are the different denominations in Troy weight:—

24 grains (24 grs.)	make	1 pennyweight	written	1 dwt.
20 pennyweights	„	1 ounce	„	1 oz.
12 ounces	„	1 pound	„	1 lb., or ℔.

APOTHECARIES' WEIGHT.

14. The weights used by apothecaries are aliquot parts of the pound Troy, and are as follow:—

---

* In scientific calculations and measurements a decimal system is most generally now used, as being much more convenient.

20 grains (grs.)	make	1 scruple,	written	1 ℈.
8 scruples	,,	1 dram	,,	1 ʒ.
8 drams	,,	1 ounce	,,	1 ℥.
12 ounces	,,	1 pound	,,	1 ℔.

APOTHECARIES' FLUID MEASURE.

		1 minim	written	♏j.
60 minims	make	1 fluid dram	,,	fʒj.
8 drams	,,	1 fluid ounce	,,	f℥j.
20 ounces	,,	1 pint (octavus)	,,	Oj.
8 pints	,,	1 gallon (congius)	,,	cong. j.

This is calculated for pure water. Hence (in avoirdupois weight).

> "A pint of pure water
> Weighs a pound and a quarter."

AVOIRDUPOIS WEIGHT.*

15. The pound avoirdupois contains 7,000 grains, and a cubic foot of distilled water, 62° Fahrenheit, weighs 62·321 pounds avoirdupois very nearly.

The following are the subdivisions :—

16 drams	make	1 ounce	written	1 oz.
16 oz.	,,	1 pound	,,	1 lb.
14 lb.	,,	1 stone	,,	1 st.
28 lb.	,,	1 quarter	,,	1 qr.
4 qrs. (112 pounds)	,,	1 hundredweight	,,	1 cwt.
20 cwt.	,,	1 ton	,,	1 ton.

A *stone* of meat, &c., is 8 lb.
A *sack* of coal is 2 cwt.
A *firkin* of butter is 56 lb.
A *firkin* of soap is 64 lb.
A *cental* (flour, etc.) is 100 lb.
A *truss* of straw is 36 lb.
A *truss* of old hay is 56 lb.
A *truss* of new hay is 60 lb.

The following weights have been used in th' wool trade : —

7 lb. = 1 clove.
2 cloves = 1 stone = 14 lb.
2 stones = 1 tod = 28 lb.
6½ tods = 1 wey = 182 lb.
2 weys = 1 sack = 364 lb.
12 sacks = 1 last = 39 cwt.

IMPERIAL LIQUID AND DRY MEASURE.

16. The gallon contains 277·274 cubic inches, and contains 10 pounds avoirdupois of distilled water at a temperature of 62° Fahrenheit.

4 gills	make	1 pint	written	1 pt.
2 pints	,,	1 quart	,,	1 qt.
4 quarts	,,	1 gallon	,,	1 gal.

For measuring dry goods, such as grain, fruit, etc., we have, further, the following denominations :—

2 gallons	make	1 peck	written	1 pk.
4 pecks (8 gallons)	,,	1 bushel	,,	1 bu.
8 bushels	,,	1 quarter	,,	1 qr.

In measuring liquids, the gallon is the largest measure recognised by legal enactment. There are, however, besides the above, many denominations still used in trade, which are derived from the names of the casks themselves. For instance, in measuring wine—

63 gallons	make	1 hogshead.
42 gallons	,,	1 tierce.
2 hogsheads	,,	1 pipe, or butt.
2 pipes	,,	1 tun.

Also for spirits—

10 gallons	make	1 anker.
18 gallons	,,	1 runlet.
2 tierces (84 gallons)	,,	1 puncheon.

And in measuring ale or beer—

9 gallons	make	1 firkin.
2 firkins	,,	1 kilderkin.
2 kilderkins	,,	1 barrel.
54 gallons	,,	1 hogshead.

And in dry measure we have also—

2 quarts	make	1 pottle.
2 bushels	,,	1 strike.
2 strikes	,,	1 coomb.
2 coombs	,,	1 quarter.
5 quarters	,,	1 load.
2 loads	,,	1 last.
3 bushels	,,	1 sack.
12 sacks	,,	1 chaldron.

MONEY.—COINAGE.

MONEY OF ACCOUNTS.

17.

4 farthings	make	1 penny	written	1d.
12 pence	,,	1 shilling	,,	1s.
20 shillings	,,	1 pound	,,	£1.

A farthing is indicated either as a fractional part of a penny (thus, ¼d.) or by the letter "q" (thus, 1q.).

The symbols £, s, d, q, are the initials of the Latin words *Libra, solidus, denarius, quadrans.*

These are the subdivisions of money in which accounts are always kept. Besides these, however, we have several coins representing other subdivisions, which are used to facilitate traffic. From this they are called *current* coins. The following is a list of our

CURRENT COINS.

Copper	A Farthing. A Halfpenny. A Penny.
Silver	Threepenny piece. Fourpenny piece. Sixpence. Shilling. 2-shilling piece, or Florin. 2½-shilling piece, or Half-crown. 4-shilling piece, or Double Florin. 5-shilling piece, or Crown.
Gold	Half-Sovereign. Sovereign (the pound piece, equivalent to 20 shillings). 2-Sovereign or 2-pound piece. 5-Sovereign or 5-pound piece.

It has already been explained, under the head of Troy weight (Art. 13), that standard gold—that is, the gold of the coinage—is $\frac{11}{12}$, or 22 carats fine. Out of a pound Troy are coined 46$\frac{29}{40}$ sovereigns, so that by dividing this by 12 we find the price of standard gold per ounce to be £3 17s. 10½d., no charge being made at the Mint for coining gold.

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* The weight used for weighing *heavy* goods, goods of weight (*avoir du poids*).

Standard silver is $\frac{37}{40}$ fine, and out of a pound Troy 66 shillings are coined; so that the Mint price of standard silver is 5s. 6d. an ounce. The market price of silver bullion is much less than this. The advantage which the Mint thus gains is called *seigniorage.*

In the new bronze coinage 48 pence are coined out of a pound avoirdupois. The bronze consists of 95 parts copper, 4 tin, and 1 zinc.

The *standard* of our coinage is gold. By this is meant that any amount of gold coin can be legally paid in liquidation of a debt, the creditor being obliged to take it. This is expressed by saying that gold to an unlimited amount is the only *legal tender.* No one is obliged to take more than 40s. worth of silver, or more than 12d. worth of copper.

Other coins besides the above were formerly in use. The guinea (21s.), the half-guinea, the 7-shilling piece, the noble (6s. 8d.), mark (13s. 4d.), the pistole (16s. 10d.), moidore (27s.).

ANGULAR MEASURE.

18. The circumference of a circle being divided into 360 equal parts, straight lines drawn to the centre will divide the four right angles at the centre into 360 equal angles. Each of these subdivisions, therefore, is equal to the 90th part of a right angle. It is called a degree, and written thus—1°. A degree is divided into 60 minutes, one of which is written thus—1′; each minute into 60 seconds, one of which is written 1″ (*vide* Art. 3, "Divisions of Time," page 112). The arcs of the circle, which subtend at the centre an angle of 1°, 1′, 1″ respectively, are also called a degree, a minute, and a second respectively. To know their actual magnitude we must know the size of the circle (see Note on page 114).

MISCELLANEOUS TABLE.

19.

12 units	are called	1 dozen (doz.)
12 dozens	,,	1 gross.
20 units	,,	1 score.
24 sheets of paper	,,	1 quire.
20 quires	,,	1 ream.
2 reams	,,	1 bundle.
5 bundles	,,	1 bale.

A sheet	folded in	two	leaves	forms a	folio.
,,	,,	four	,,	,,	quarto (4to).
,,	,,	eight	,,	,,	octavo (8vo).
,,	,,	twelve	,,	,,	duodecimo (12mo).
,,	,,	eighteen	,,	,,	eighteen-mo (18mo).
,,	,,	thirty-six	,,	,,	thirty-six-mo(36mo).

KEY TO EXERCISES.

EXERCISE 51.

1. 2, 4, $\frac{1}{4}$, 9.
2. 4, 8.
3. 3, $\frac{1}{7}$.
4. 10, 13, $1\frac{7}{30}$.
5. $3\frac{3}{4}$, $4\frac{1}{6}$, $\frac{11}{15}$.
6. $3\frac{2}{3}$, $4\frac{1}{5}$, $\frac{11}{15}$.
7. $2\frac{1}{4}$, $3\frac{1}{6}$, $\frac{1}{30}$.
8. ·85516.
9. 30 : 70.
10. 170.
11. 200 : 240.
12. 189.
13. $230\frac{1}{4}$: $690\frac{3}{4}$.
14. 702.

ASTRONOMY.—IX.

[*Continued from p.* 109.]

THE FIXED STARS: THEIR MAGNITUDES AND DISTANCES—SHAPE OF OUR CLUSTER—DOUBLE, COLOURED, AND VARIABLE STARS—CONCLUSION.

We must now turn our attention to the fixed stars. It is very difficult by mere inspection to form a reliable estimate of the number of these bodies, it appears, however, from catalogues which have been compiled, that the total number visible to the naked eye is about 6,000. But only half of the sky can be seen at one time, and the number visible on a clear night may therefore be set down approximately at 3,000. These stars vary very greatly in brilliancy, and have accordingly been divided into classes, according to apparent size, the brightest being said to be of the first magnitude, while the faintest visible to the naked eye are classed as the sixth, and the faintest discernible in powerful telescopes as the sixteenth.

As a general rule, it is computed that stars of the first magnitude are about 100 times as brilliant as those of the sixth. The light of Sirius, the brightest star in the sky, is, however, estimated to be equal to that of 324 of the latter.

If we direct a telescope to the heavens we shall immediately perceive that large numbers of small stars, like points of light, become visible where the unaided vision fails to see any. These are called telescopic stars, and many millions of such stars exist. Their minuteness may not be owing to really small size, but to great distance, though this question cannot be answered with absolute certainty.

The distances of the stars are ascertained in the same manner as those of the sun and planets—that is, by parallax. Instead, however, of taking two stations at different parts of the earth's surface, and laying down a base line between them, we take the diameter of the earth's orbit, or 186,000,000 miles, as the base, the observations being taken at intervals of six months.

Even with this immense line, however, the parallax is so small that it can only be detected by the most careful observations and accurate instruments. In no case has it been found to be greater than 1″; and if this be its value, the distance of the star must be 206,000 times as great as that of the sun. The parallax of more than thirty stars has now been ascertained, and is found to vary between 0·919″ and a small fraction. The star α Centauri is the nearest to the earth, and its distance is estimated at 20,496,000,000,000 miles, or more than 20 billions of miles; while the average distance of stars of the first magnitude is probably three or four times as great as this. These figures, however, fail to convey to the mind any definite idea as to the real distance; perhaps the best mode of expressing it is by stating that light, with its speed of 187,000 miles a second, takes 3½ years to travel from that star to us; while the smaller telescopic stars are so remote that it must require upwards of 1,000 or 2,000 years for their light to reach us.

As a means of readily referring to the stars, some method is required to identify them apart. Special names have, therefore, been applied to the more brilliant of these objects, and the principal groups of stars have been arranged into constellations, of which the number is about 109. But some of these are not universally adopted.

Fig. 34.—Orion.

In a celestial atlas published by Bayer in 1604 the letters of the Greek alphabet were affixed to the stars in each constellation, the brightest star being called α, the next β, and so on. This plan answered its purpose so well that it still remains in practice. Sometimes, however, the letters of the English alphabet are given when the Greek letters are insufficient, and numerals have been occasionally applied, especially by Flamsteed.

The best plan for the student to become practically familiar with the different constellations is to study the sky itself, with the aid of some maps or of a globe. Several of the constellations—as, for instance, the Pleiades, the V-shaped cluster of the Hyades, and Orion (Fig. 34), with the three stars in the belt, commonly known as the Yard Measure—are familiar to almost everyone; these will serve as a guide in determining others.

The stars are all of them bright, self-luminous bodies like our sun, which in all probability appears to other worlds to be one of the stars. Delicate observations show us that they have proper motions, but it is very difficult to determine these. We can, however, ascertain the motion of the sun by observing the relative distances of the stars. We find that in one part of the sky the stars seem to be very gradually opening out, and getting farther apart; while in the opposite quarter they are as gradually closing up, evidently showing that we are moving towards the former part, just as when we are travelling in a wood the trees in front are apparently opening out, while those we have passed appear to be getting closer together.

Astronomers have naturally been anxious to ascertain something of the shape of the whole cluster of stars which constitutes our system, and have employed the telescope as a sounding-line to learn the depth in different directions. If the stars are scattered at all uniformly in space, they will, of course, appear more sparse in those parts where we look through the thinnest layer of them. Now when we observe the sky on a clear night, we at once notice a faint white band passing across it, commonly known as the *Milky Way.* (*See* Star Plate.) In one part of its course it divides into two branches, which, after passing about a third round the sky, again unite into one. Powerful telescopes show us that this consists of a dense mass of minute stars. The greater number, indeed, of those visible are clustered along this line, while in those parts of the sky removed from it the number of telescopic stars is comparatively small; hence we may reasonably assume that this belt indicates to us the direction in which the greatest number of the stars lie, and in which our cluster extends farthest into distant space.

From this we may form an idea of our system, and it seems that the best representation of it may be obtained by taking a flat circular body and splitting it by passing a knife about one-third of the way through, the two parts being made to diverge a little, as shown at *a*, *b* (Fig. 35). The sun (S) is situated somewhere near the centre, and the split side causes the divided appearance of the Milky Way. One of the nebulæ, when seen through a powerful telescope, is found to present a somewhat similar appearance, and is considered to be a cluster closely resembling our own.

When we look at the heavens on a clear night, we observe here and there two stars in very close proximity; the telescope further reveals to us that very many of these, which appear to the naked eye as single stars, consist in reality of two or more so close together that they appear as one. Sir W. Herschel was the first to direct special attention to these objects, of which he compiled a list. He also discovered that in some cases the two stars were revolving round each other, forming a related system. These are all called Binary-stars, and some hundreds of them are at present known.

One remarkable feature in connection with the double stars is the fact that in some instances the components are of different colours. In R Leporis, for instance, one is white, while the other is a deep red; in β Cygni, again, the colours are yellow and blue; and in γ Andromedæ, they are orange and green.

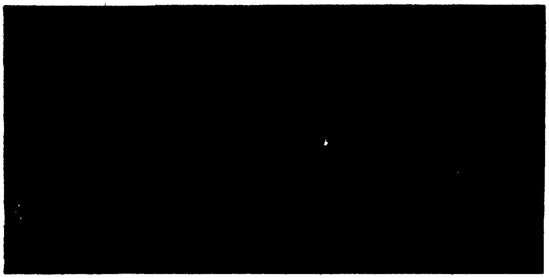

Fig. 85.—Section of the Milky Way.

When we come to note the tints of different stars, and compare them with former records, we find that in a few instances a change has taken place. Thus Sirius, which now shines with a pure white light, is spoken of by ancient observers as a ruddy star. There are also many others which exhibit changes in brilliancy, but these changes seem, in most cases, to be open to question. The star *o* Ceti, called also Mira, or the Wonderful Star, is a remarkable object. At the time of its greatest brightness it is usually of the first or second magnitude; it then decreases for two or three months, till it becomes invisible, and remains so for about five months, its minimum brightness being about equal to that of a twelfth magnitude star. Its lustre then revives, and the whole period occupied by these changes is about 331 days.

Algol, or β Persei, is another variable star, notable for its short period and rapid changes. It ordinarily appears as a star of the second magnitude, but in a period of three and a half hours it diminishes in brightness to the fourth magnitude, and after a few minutes begins again to increase, attaining its former brilliancy in another period of three and a half hours. At this it remains two days thirteen hours, and then the same series of changes recurs.

Fig. 86.—The Great Nebula in Orion.

Possibly allied to the variable stars are the new or temporary stars, which have at times attracted so much attention. Several such appearances have been recorded; one of the most remarkable, however, is that observed by Tycho Brahe, in November, 1572. This star seems to have burst forth very suddenly, as it is said that the constellation Cassiopeia, in which it appeared, had been carefully observed by an astronomer only two evenings before the star was seen, and that then no trace of it was observed. The star continued visible for about sixteen months, gradually becoming fainter till it disappeared. Its brilliancy at first was so great that it cast a sensible shadow, and it is said to have been so bright that it was observed at noonday. This star deserves special mention because certain writers have attributed to it a significance which it does not merit. It has been asserted on very doubtful authority that new stars had also appeared in the same constellation in 945 and 1264, and that the observations all referred to the same star, which returned at intervals of 312 years. It was further stated that this body must have been identical with the Star of Bethlehem, and that probably it would again burst forth at about the present time. These assumptions are, however, quite erroneous. The new stars said to have been visible in 945 and 1264 were brilliant comets, and there is no solid foundation for the theory that Tycho Brahe's star is identical with the Star of Bethlehem, or that it has a definite period of recurring brilliancy.

Another temporary star appeared in 1604. Amongst modern instances of these curious outbursts we may mention that a new star was seen in the Northern Crown on May 12, 1866; in Cygnus in November, 1877; and in the midst of the great nebula of Andromeda in August, 1885.

Various explanations have been offered to account for the phenomena of a variable star. Some imagine the star to rotate, and one portion of its surface to be more luminous than another; others suppose that a planet may revolve around the star, and thus occult its light. None of the theories stated, however, appear satisfactory, and we can only wait in the hope that future research, aided by the spectroscope and by more refined instruments, may throw fresh light on the whole subject. All the variables are being closely watched with this object.

Besides the stars and planets, we easily distinguish in the sky various groups called clusters or nebulæ. These are usually divided into—

Irregular Groups, more or less visible to the naked eye;

Clusters, resolved by a good telescope; and

Nebulæ, many of which are irresolvable with the most powerful telescopes yet made.

There are many examples of the first class, among which may be mentioned Præsepe, or the Beehive, and the Sword Handle in Perseus, both of which are very beautiful objects for the telescope. Very many objects of the second class have also been noted. In ordinary telescopes they appear for the most part as faint cloudy masses; but as more powerful instruments are directed to them they begin to resolve into stars placed very close together. Every increase yet made in the power of the telescope has had the effect of resolving more of these clusters.

In shape and appearance they vary greatly, some being globular or elliptical masses, while others present very strange forms. The Great Nebula in Orion (Fig. 36), and the Dumb Bell Nebula in Vulpecula, are examples of this. Many, however, can only be partially resolved, films of misty matter, gradually fading away at their edges, being distinguishable apart from the stars.

So great is the number of these objects that a catalogue of them published in 1888 contains no less than 7840.

An idea of the extreme faintness of many nebulæ may be formed from the estimate which has been made that their light varies from $\frac{1}{1500}$ to $\frac{1}{2000}$ of that of a sperm candle a quarter of a mile distant.

Some of these nebulæ have a spiral form. The best known of these is in the constellation Canes Venatici. In Sir John Herschel's telescope it presented the appearance of a bright globular cluster, partially resolvable, occupying the centre, while surrounding it is a ring divided for nearly half the circumference into two bands. Just outside this is a second cluster. When, however, Lord Rosse's gigantic reflector was directed to this nebula, it presented quite a different appearance, and seemed to consist of spiral coils of nebulous matter, with which the outer portion was connected. Several other spiral nebulæ are known.

Besides these masses, nebulous stars may be observed in different parts of the sky. These are usually of a circular form, and consist of a star surrounded with a faint cloudy mass, which is not resolvable into minute stars.

The nebulæ are not distributed by any means uniformly over the surface of the sky, the majority being situated in a zone crossing the Milky Way at right angles. In the constellation Virgo there is the greatest congregation of them, one portion of it being known as the nebulous region of Virgo; and in the southern hemisphere, not far removed from the pole, are two brilliant cloud-like patches called the Magellanic clouds or Nubeculæ. These, when examined by the telescope, are found to consist of large numbers of stars, clusters, and nebulæ collected together. In appearance they somewhat resemble a portion of the Milky Way, but they are quite distinct from it.

The question as to the real constitution of the nebulæ is one that has given rise to much inquiry and controversy. There seems now to be little or no doubt that many of them are universes somewhat resembling our own, immensely removed from us. This theory rapidly gained ground as one after another of the nebulæ was resolved by the construction of more powerful telescopes, and it was very generally believed that all the nebulæ would ultimately be thus resolved. The hypothesis previously received was that they consist merely of masses of cloud-like matter, and modern researches seem now to indicate that in some few cases this may be correct. When the spectroscope was first directed to one of these objects, no spectrum could be obtained, but merely a short luminous band. A second and third much fainter bands were afterwards made out, and these lines were found to correspond with those indicative of nitrogen, hydrogen, and barium. These facts seem to point strongly to the conclusion that certain nebulæ do not consist of solid matter, but merely of an incandescent gas.

The Nebular Hypothesis, as it is termed, not only accounts for the nebulæ, but also for the formation of our entire system. According to it, the sun and all the planets originally existed in the form of a globular mass of nebulous matter, filling a space greatly exceeding the orbit of Neptune. This mass had a motion of rotation, and, as it gradually cooled, became more and more condensed, until at length some part assumed the liquid state, and would then form a ring surrounding the central mass. This ring was, of course, in rotation, and as it could scarcely be of uniform thickness throughout, would soon break up; the matter composing it was then collected into a ball still rotating around the centre, and at the same time turning on its own axis.

In this way all the planets were in turn formed, and they, by centrifugal force, threw off their satellites and rings, till at length the system was complete, and the planets cooled down into solid masses.

We have now completed our hasty survey of this, one of the most wondrous and sublime of all sciences. Passing from the early and rude observations of shepherd astronomers, down to the grand discoveries of modern times, we have seen what progress has been made in solving the mysteries of the heavens, and how, by the united and persevering efforts of a long succession of illustrious astronomers, our knowledge of the celestial bodies has steadily increased. The complications and disorder which ancient observers had apparently to deal with have been swept away, and a keener insight obtained into the facility and harmonious regularity of the laws which govern the orbs of space. The former difficulties and doubts have given place to a smooth reliance on the modern principles which have been revealed to the inquiring mind of man. The astronomy of to-day is based upon facts and supported by theories which will endure as long as the earth itself.

GERMAN.—IX.

[*Continued from page* 88.]

EXAMPLES.

Mit der Ruhe eines Sto'ikers ertrug' er den hef'tigſten Schmerz.	With the (quiet) calmness of a Stoic he endured the most violent pain.
Bei dem Gedan'ken an die Schmach ſeines Va'terlandes konnte er die Thränen nicht länger zurück'halten.	At the thought of the disgrace of his native country he could not (longer) repress (the) his tears.
Wir müſſen uns beſtre'ben, wenn wir anders gute Bürger ſein wollen, mit unſern Kräften und nach unſerm Vermö'gen dem Staate zu nützen.	We must exert ourselves, if we (otherwise) wish to be good citizens, with all our strength and according to our ability to serve the State.
Wir dürfen Andern nicht thun, was wir nicht wünſchen von ihnen gethan zu haben.	We must not do to others what we do not wish to have done by them.
Er hat Briefe ſchreiben wollen.	He has wished to write letters.
Wird ſie gehen müſſen?	Will she be obliged to go?
Sie wird nicht gehen können.	She will not be able to go.
Wir haben es nicht thun mögen.	We have not wished to do it.
Sie werden gehen dürfen.	You will be allowed to go.
Ich mußte den ganzen Abend leſen.	I was obliged to read the whole evening.
Sie hatten es nicht thun ſollen.	They ought not to have done it.

VOCABULARY.

Auf'merkſam, attentive.
Daß, that.
Deutſch, German.
Druckſchrift, *f.* print.
Finden, to find.
Geduld', *f.* patience.
Genug,' enough.
Güte, *f.* goodness, kindness.
Handſchrift, *f.* handwriting, manuscript.
Hausfrau, *f.* housewife.
Kirſche, *f.* cherry.
Können, can, to be able.
Kunſt, *f.* art, skill.
Lernen, to learn.
Leſen, to read.
Mannheim, *n.* Mannheim.
Morgen, to-morrow.
Müſſen, must.
Nächſt, next.
Neidiſch, envious.
Regnen, to rain.
Sagen, to say.
Schwer, heavy, hard, difficult.
Thun, to do.
Verkau'fen, to sell.
Warten, to wait.
Woche, *f.* week.
Wollen, to will.
Zeit, *f.* time.

EXERCISE 35.

Translate into English:—

1. Wollen Sie mit mir nach Mannheim gehen? 2. Ich kann nicht, ich habe keine Zeit. 3. Wann können Sie gehen? 4. Ich werde die nächſte Woche gehen, wenn Sie ſo lange warten können. 5. Will Ihr Lehrer mit Ihnen auf das Feld oder nach der Stadt gehen? 6. Er will nicht auf's (auf das) Feld, und kann nicht nach der Stadt gehen. 7. Was wollen dieſe Kinder? 8. Sie wollen Äpfel und Kirſchen, aber ſie können keine kaufen, denn ſie haben kein Geld. 9. Was wollen Sie, mein Herr? 10. Wollen Sie die Güte haben, mir ein Glas Waſſer zu geben? 11. Können Sie mir ſagen, wie viel Uhr es iſt? 12. Ich kann es Ihnen nicht ſagen, ich habe keine Uhr bei mir. 13. Was wollte der Kaufmann Ihnen verkaufen? 14. Ich konnte nichts bei ihm finden, was ich kaufen wollte. 15. Wir werden morgen ſchlechtes Wetter haben. 16. Es kann ſein, daß es noch heute regnen wird. 17. Können Sie die deutſche Handſchrift leſen? 18. Nein, ich habe genug mit der Druckſchrift zu thun. 19. Der Neidiſche will ſeinen Freund nicht loben. 20. Eine Gelehrte iſt nicht immer eine gute Hausfrau. 21. Geduld iſt eine ſchwere Kunſt; Manche können ſie lehren, aber nicht lernen. 22. Ein guter Lehrer muß Geduld haben. 23. Jeder gute Schüler wird aufmerkſam ſein.

EXERCISE 36.

Translate into German:—

1. You can go into the garden, but you cannot remain there long. 2. These attentive scholars were allowed to go with their teacher to Mannheim. 3. We can employ our time better. 4. Can you speak German? 5. We could not learn our lessons this week. 6. You must learn this week's lessons attentively. 7. You may go to-morrow to your parents. 8. He may be a good man. 9. The

housewife must (is obliged to) go to market to-morrow? 10. Have you written to your parents? 11. Yes, I was obliged to write. 12. It is two o'clock. 13. I shall arrive at your house at a quarter past three o'clock. 14. Will you come twenty minutes before eight o'clock? 15. I may come to your house this evening, but do not wait for me. 16. As long as it rains I cannot go out. 17. Fish can only live in water, and birds in the air. 18. You should not have done that; it will not be any recommendation to you. 19. I wish to go to the theatre this evening. 20. We may not have the opportunity another time.

THE INFINITIVE, ETC.

When not following an auxiliary verb of mood, the infinitive takes the preposition zu before it, and if it means "in order to," um zu, as:—Ich habe Zeit zu leſen, I have time to read; Er geht in die Schule, um zu lernen, he goes to school, *in order to* learn; Er geht auf den Markt, um Fleiſch zu kaufen, he goes to market, *in order to* buy meat. Um, *in order*, is, as in English, often omitted, as:—Er geht auf den Markt, Fleiſch zu kaufen, he goes to market *to* buy meat.

Können often signifies *to know*, *to have learned a thing*, and may be followed by a noun in the accusative, as:—Können Sie Deutſch? do you know (understand) German? Followed by a verb, können signifies either *to be able* or *to know how*, as:—Kann er ſchreiben? can he write? *or*, does he know how to write? has he learned to write?

Wiſſen, *to know*, is frequently placed before an infinitive with zu, and corresponds to our phrase "to know how," as:—Er weiß zu ſchreiben, he knows (how) to write; Er weiß zu leben, he knows (how) to live; Er weiß ſich zu helfen, he knows (how) to get on.

Kennen also signifies *to know*, but only in the sense of *to be acquainted with*, as:—Kennen Sie dieſe Leute? do you know these people? Ich kenne ſie, I know them, I am acquainted with them.

The indefinite pronoun man has no exact equivalent in English. It corresponds to *one*, or *they*, or even *we*, thus:—Man ſollte immer ehrlich handeln, *one* should always act honourably; Man läuft, they are running; Man ſchreit they are crying; Ertragen muß man, was der Himmel ſendet, what (the) Heaven sends must we endure. Man is often nominative to an active verb, which latter is best rendered by a passive one, as:—Man weiß, wo er iſt, it is known where he is; Man hat den Dieb gefangen, the thief has been caught.

The above use obtains especially in the phrase „man ſagt" (French, *on dit*), which, though more literally "one says," is often better rendered by "they say, it is said, rumoured, reported," etc.

EXAMPLES.

Er iſt fleißig, nicht nur um das Lob ſeines Lehrers zu erwer'ben, ſondern um ſeine Kennt'niſſe zu erwei'tern.	He is diligent, not only to obtain the praise of his teacher, but in order to extend his knowledge.
Wir eſſen, um zu leben; aber wir leben nicht, um zu eſſen.	We eat in order to live, but we do not live in order to eat.
Ein kluger Mann weiß zu ſchweigen.	A judicious man knows (how) to be silent.
Ein un'beflecktes Herz iſt ein ſtiller heller See, dem man auf den Grund ſieht.	An unspotted heart is a still clear sea, which one sees to the bottom.
Ein Freund iſt ein Münze; man prüft ſie, ehe man ſie nimmt.	A friend is a coin; it is proved before it is received.

VOCABULARY.

Elend, wretched.
Hei'delberg, *n.* Heidelberg.
Holen, to go for.
Käſe, *m.* cheese.
Latei'niſch, Latin.
Machen, to make, to do.
Schneiden, to cut.
Sollen, shall.
Sprache, *f.* language.
Um, in order. (*See above.*)
Wahl, *f.* choice.
Wieſe, *f.* meadow.

EXERCISE 37.

Translate into English:—

1. Ich muß auf die Wieſe gehen, Heu zu holen. 2. Was ſoll Ihr Bruder in der Schule thun? 3. Er ſoll in die Schule gehen, um die lateiniſche Sprache zu lernen. 4. Der Menſch muß ehrlich oder elend ſein. 5. Was ſoll ich thun? 6. Sie können thun was Sie wollen, und ſollten thun was Sie konnen. 7. Warum ſind Sie nicht geſtern zu uns gekommen? 8. Ich wollte, aber ich konnte nicht; ich mußte zu Hauſe bleiben und leſen. 9. Wird der Schneider mir einen Rock machen wollen? 10. Er wird Ihnen einen machen wollen, aber er wird es nicht thun können. 11. Warum wird er es nicht thun können? 12. Er wird morgen auf das Land gehen müſſen, ſeinen kranken Bruder zu beſuchen. 13. Was will der Knabe mit ſeinem Meſſer? 14. Er will Brod und Käſe ſchneiden. 15. Haben Sie Zeit, in den Stall zu gehen? 16. Ich habe Zeit, aber ich will nicht gehen, ich will zu Hauſe bleiben. 17. Was haben Sie zu Hauſe zu thun? 18. Ich habe Briefe zu leſen und zu ſchreiben? 19. Müſſen Sie ſie heute ſchreiben? 20. Ich muß ſie heute ſchreiben, weil ich morgen nach Heidelberg gehen will. 21. Man muß in der Wahl ſeiner Freunde vorſichtig ſein. 22. Dieſer Knabe hat heute gar nichts gelernt. 23. Haben Sie auch nichts gelernt? 24. Ich habe etwas gelernt, aber nicht viel.

VOCABULARY.

Aus, out of, from.
Baier, *m.* Bavarian.
Berg, *m.* mountain.
Böhme, *m.* Bohemian.
Brunnen, *m.* well.
Dienſt'mädchen, *n.* servant-girl.
Dorf, *n.* village.
Fenſter, *n.* window.
Flinte, *f.* gun.

Hausknecht, *m.*	house-servant.
Heſſe, *m.*	Hessian.
Krakau, *n.*	Cracow.
Neu'igkeit, *f.*	news.
Schachtel, *f.*	box.
Schloß, *n.*	castle, palace.
Ungarn, *n.*	Hungary.
Warſchau, *n.*	Warsaw.

EXERCISE 38.

Translate into English :—

1. Zu wem gehen Sie? 2. Ich gehe zu meinem Bruder. 3. Mit wem geht dieſer Knabe? 4. Er geht mit ſeinem Vater nach der Stadt. 5. Von wem haben Sie dieſe Neuigkeiten gehört? 6. Ich habe ſie von meinem alten Freunde gehört. 7. Mit wem gehen Sie nach dem Dorfe? 8. Ich gehe nicht nach dem Dorfe, ich gehe mit meinem Vater nach der großen Stadt. 9. Wann gehen Sie aus der Stadt zu unſern Freunden? 10. Wir gehen nicht zu Ihren Freunden, wir kommen morgen wieder nach Hauſe. 11. Ich gehe heute weder zu meinem Freunde, noch nach dem Dorfe, noch aus dem Hauſe. 12. Der Graf hat ein großes Schloß mit kleinen Fenſtern. 13. Der Fluß kommt aus den Bergen. 14. Hat Ihr Vater etwas von ſeinem Bruder gehört. 15. Ja, dieſer Mann iſt aus Ungarn, und hat meinem Vater eine Schachtel von meinem Oheim gebracht. 16. Geht er nach Wien? 17. Nein, er geht nach Warſchau, und von Warſchau nach Krakau. 18. Der Baier, der Böhme, und der Heſſe kommen aus Deutſchland. 19. Der Jäger mit ſeiner Flinte kommt aus dem Walde. 20. Der Knecht geht nach der Stadt. 21. Ich habe von meinen Brüdern gehört, ſie gingen zu ihrem Freunde. 22. Das Dienſtmadchen kommt vom Brunnen, und der Hausknecht geht zum Fleiſcher.

EXERCISE 39.

Translate into German :—

1. If we desire to be happy we must not deviate from the path of virtue. 2. I know that he is not your friend, but I know likewise that he is a man of probity. 3. Let them know that this news is only a rumour. 4. They must not say everything they know. 5. You must be very careful in the choice of your friends. 6. We ought to know to whom we apply. 7. Will you tell the tailor, when he has finished your coat, to call on me? 8. Have you time to go with me to the city? 9. If he had not been able to perform the work he would not have undertaken it. 10. Have you time to read this letter? 11. He goes to school in order to learn the Latin language.

SEPARABLE PARTICLES.

The particles ab, an, auf, aus, bei, mit, nieder, um, voraus, etc., are often compounded with verbs, and, as they may stand apart or be separated from the verb with which they are compounded, they are called ***separable*** particles.

1. In ***principal sentences*** the particle is separated from the verb and placed at the end. In ***subordinate sentences***, however, the particle and the verb remain always in union, as :—Er wirft den Wagen um, he overturns the waggon; Der Wagen, den er umwirft, the waggon which he overturns; Ich hob den Stein auf, I lifted the stone up; Der Stein, welchen ich aufhob, the stone which I lifted up; Der Mann geht aus, the man goes out; Der Mann, welcher ausgeht, the man who goes out; Er ſchrieb den Brief ab, he copied the letter; Der Brief, den er abſchrieb, the letter which he copied; Er brach die Blumen ab, he broke off the flowers; Sie iſt traurig weil er die Blumen abbrach, she is sad because he broke off the flowers.

2. In the infinitive mood the particle is never separated from the verb, except by zu, which, when used, stands between the two, as :—Er nill ausgehen, he will go out; Kann ſie abſchreiben? can she copy? Er iſt bereit den Wagen umzuwerfen, he is ready to overturn the waggon.

3. In the past participle, the augment, ge, comes between the particle and the radical; the particle of course being always *prefixed*, as :—Er hat den Brief abgeſchrieben, he has copied the letter; Er hat den Wagen umgeworfen, he has overturned the waggon; Ich habe den Brief, welchen er abgeſchrieben hat, I have the letter which he has copied.

EXAMPLES.

Das Gewiſ'ſen iſt die Stimme der Seele; die Lei'denſchaften ſind die Stimmen des Körpers; auf welche von beiden Stimmen ſoll man hören?	The conscience is the voice of the soul, the passions are the voices of the body; to which of these (both) voices shall one listen?
Und ſie gingen Jo'nathan nach, als er hinaus'zog zu David.	And they went after Jonathan as he drew (forth) toward David.
Das geht mich nicht an.	That does not concern me.
Die Sonne geht um fünf Uhr auf.	The sun rises (goes up) at five o'clock.
Die Sonne iſt ſchon auf'gegangen.	The sun has already risen.

VOCABULARY.

Ab'geſchieden,	separated.
Ab'ſetzen,	to dispose of, sell.
Ab'ſteigen,	to descend, dismount.
An'deuten,	to indicate, declare.
An'preiſen,	to praise, extol.
An'ſpornen,	to incite.
An'treiben,	to urge, drive.
An'wenden,	to apply, employ.
An'zeigen,	to point out, show.
An'ziehen,	to attract.
Auf'heben,	to revoke, give up.
Auf'richten,	to elevate, support.
Auf'ſchieben,	to defer, put off.
Auf'ſreichern,	to garner, store up.
Auf'ſteigen,	to ascend, mount.
Aus'dreſchen,	to thrash.
Ausſicht, *f.*	prospect.
Been'digung, *f.*	termination.
Beloh'nung *f.*	reward.
Bibel, *f.*	Bible.

Bliß, *m.* lightning.
Doch, yet.
Drohung, *f.* threatening.
Drücken, to afflict, oppress.
Eile, *f.* haste, speed.
Ein'ſammeln, to collect.
Ein'ſchließen, to shut up, confine.
Entlaſ'ſen, to discharge, pay off.
Eremit', *m.* hermit.
Erfül'len, to fill.
Feldfrucht, *f.* fruit of the field.
Gebet', *n.* prayer.
Gebirg'e, *n.* chain of mountains.
Grünſpan, *m.* verdigris.
Klauſe, *f.* cell.
Kunde, *m.* customer.
Licht, *n.* light.
Liebe, *f.* love.
Magnet', *m.* loadstone.
Magnet'nadel, *f.* magnetic needle.
Mehr, more.
Mit'gehen, to go with.
Müde, tired, weary.
Norden, *m.* north.
Peſt, *f.* plague, pestilence.
Rach'ſüchtig, revengeful.
Reichlich, rich.
Reiter, *m.* rider.
Retten, to save, rescue.
Sanft, mild, soft,
Sonne, *f.* sun.
Sprichwort, *n.* adage.
Steigen, to rise.
Süden, *m.* south.
Un'tergehen, to go down, set.
Un'terirdiſch, subterranean.
Verhei'ßung, *f.* promise.
Weg'fliegen, to fly away.
Weg'raffen, to carry off, destroy.
Welt, *f.* world.
Zeiſig, *m.* greenfinch.

EXERCISE 40.

Translate into English :—

1. Die Reiter trieben bei dieſer Nachricht ihre Pferde zu größerer Eile an. 2. Der ſchöne Zeiſig iſt dem Knaben weggeflogen. 3. Die Ausſicht einer reichlichen Belohnung ſpornte ſie an, das Kind des reicher Edelmannes zu retten. 4. Der Bauer hat ſeine Feldfrüchte eingeſammelt, ausgedroſchen und aufgeſpeichert. 5. Der Rachſüchtige wendet gern das Sprichwort an: „aufgeſchoben iſt nicht aufgehoben." 6. Abgeſchieden von den Menſchen lebt der Eremit in ſeiner Klauſe. 7. Der Krieg hat viele Menſchen weggerafft, aber doch noch mehr die Peſt. 8. Die Sonne iſt untergegangen. 9. Der König hat nach Beendigung des Krieges viele Soldaten entlaſſen. 10. Der Magnet zieht das Eiſen und den Bliß an. 11. Die Magnetnadel ziegt dem Steuermann Nord und Süd an. 12. Die Drohungen ſowohl als die Verheißungen in der Bibel deuten die Liebe Gottes an. 13. Der kupferne Keſſel hat Grünſpan angezogen. 14. Der Müller hat ſein Mehl abgeſetzt. 15. Der Vater hat den Hund in ſein Zimmer eingeſchloſſen. 16. Der Kaufmann preiſt das Tuch ſeinen Kunden an. 17. Das Gebet richtet ein gedrücktes Herz auf. 18. Der Mond ſteigt hinter dem Gebirge auf und erfüllt die Erde mit ſeinem ſanften Lichte. 19. Ich ſteige in den Wagen, Sie ſteigen aus dem Wagen, und er ſteigt auf das Pferd. 20. Die müden Reiter ſteigen von ihren Pferden ab. 21. Wollen Sie mich mitnehmen, wenn Sie nach Deutſchland reiſen? 22. Ich glaube nicht, daß Sie mitgehen wollen.

EXERCISE 41.

Translate into German :—

1. After the termination of the war the soldiers will be paid off. 2. I shall go with your brother to the hermit, who lives separated from the world. 3. The farmer has collected the corn in the field. 4. The citizens are shut up in the town by the enemy. 5. The war and the plague have destroyed a great many people. 6. The weary rider dismounts from his horse. 7. The merchant has disposed of his stock. 8. The sun rises in the east. 9. The sun rises at twenty minutes past five o'clock, and sets at half-past six. 10. You must incite your scholars to be more studious. 11. Will you defer your visit for to-morrow? 12. The magnetic needle points to the north. 13. The scholar has copied his lessons.

KEY TO EXERCISES.

Ex. 33.—1. Where is the lead that you have bought? 2. It is still in the shop where I bought it. 3. Have you the same pen which I have had? 4. To whom will you send this gold watch? 5. I shall send it to the same man who sent it to me. 6. How much money does this old soldier require? 7. He requires much, because he is always ill. 8. Is he the same person who was here yesterday? 9. No, that one is very lame to-day. 10. To whom do you send this beautiful ring? 11. I send it to the man whom you have praised so much. 12. Have you praised my brother's friends? 13. Yes, I have praised them. 14. Have you not loved them? 15. I have a little sister whom I love; do you love her? 16. The uncle loves his nephew, but he is unthankful. 17. The father loves his little son because he is good. 18. Why are so many troops in the town? 19. Because they have come from the war. 20. Why do our parents love us? 21. Because we are their children. 22. To whom are you going? 23. I am going to my cousin. 24. With whom are you going? 25. I go with my brother.

Ex. 34.—1. Iſt Ihr Bruder zu Hauſe? 2. Ja, aber er iſt krank. 3. Wo haben Sie dieſe Uhr gekauft? 4. Ich habe ſie bei dem Uhrmacher gekauft. 5. Dieſe Ringe ſind ſchön, wollen Sie mir einen derſelben geben? 6. Die Truppen, welche nach Leipzig gingen, kehrten geſtern zurück. 7. Der Lehrer liebt den Knaben, weil derſelbe ſchön ſchreibt. 8. Gehen Sie zu Ihren Eltern? 9. Ich gehe mit meinem Bruder. 10. Dieſe Kinder lieben ihren Lehrer, weil derſelbe gut zu ihnen iſt. 11. Gebrauchen Sie meine Bücher noch länger? 12. Ich werde Ihnen dieſelben morgen zurück geben.

ANTHROPOLOGY.—I.

INTRODUCTION—TRANSMISSION OF QUALITIES, ETC.

WHEN we proceed to what Pope asserts to be "the proper study of mankind," we are at once struck by the fact that its professors hardly even yet know what term to apply to the science that deals with the natural history of Man. Some call it *Ethnology* (**ἔθνος**, *ĕthnŏs*, a race, and **λόγος**, *lŏgŏs*, a discourse); others, *Ethnography* (**ἔθνος**, and **γράφω**, *grăphō*, I write); others, *Anthropology* (**ἄνθρωπος**, *ănthrōpŏs*, man). The term Ethnology, as applied to the natural history of Man, is entirely out of date. Those who habitually use it in this sense are survivors of the generation which was nurtured on the masterly treatise of Dr. Pritchard. At best, Ethnology was never more than that branch of the biology of mankind which dealt with the classification of the different varieties of the human species. But the term unfortunately implied that mankind was divisible not into varieties of *one* race, but into distinct races cut off from each other by specific differences. Its use was therefore offensive to those who believed that there was only one race of mankind, which sprang from a single source, though under the pressure of changeful surroundings its members had differed here and there so much from the original type that it was possible to group them into many varieties. Ethnography is a term the original meaning of which has not much changed. Among scientific men it is now applied to that branch of the natural history of Man which deals with the descriptive details of each human group. An *ethnologist*, if one may for a moment revert to the old-fashioned word, would review and classify on some common basis the various social and physical phenomena he could discover in all the known varieties of the human race. An *ethnographer*, on the other hand, would confine himself to the description of one race at a time, with its peculiar habits of body, mind, and of physical and social life.

There is another term now in vogue, *Demography*, the meaning of which is very seldom understood. It is applied to that branch of the natural history of Mankind which deals with the automatic life of masses of human beings, in other words, with the statistical aspects of human action and vitality. Quételet may be said to have been the founder of Demography. The late Mr. T. H. Buckle intended to take it as the basis of his "History of Civilisation." The late Dr. Farr, whose papers in the Registrar-General's Reports for many years were eagerly looked for by the learned world, did more than any investigator in England in the Victorian age to advance this science. and since his time Sir Frederick Galton has been regarded as its leading exponent.

What has now been said will explain why men of science have selected the new term Anthropology to describe the branch of science that treats of the natural history of human beings. It is wide enough to embrace all the other terms heretofore used, one of which (Ethnography) was too narrow in its meaning, and the other of which (Ethnology) was not only narrow in meaning, but bad, because it implied submission to the doctrines of those who denied the essential unity and common origin of the human race. Anthropology is, however, itself, only a branch of Biology, the science of living beings; in fact, Broca probably had this conception in his mind when he defined Anthropology as the "biology of the Human Race."* As good a division as any would be the following:—

General Anthropology.—The study of mankind in all its relations to Nature or the natural history of Man.

(1) *Zoological Anthropology*—the study of Man's relations to the animal world, and the zoological classification of the varieties of the human species.

(2) *Ethnography or Descriptive Anthropology*—the description and record of the special physical phenomena—institutions, customs, superstitions, and legends, of particular human groups.

(3) *Ethnology Proper*—the rational exposition and classification on general principles, and in terms of general laws, of the body of knowledge collected in specialised form by Ethnography.

A fourth subdivision of general Anthropology would be *Demography*, the statistical relations of the human species and its varieties, especially in relation to health, disease, reproduction, and death. But as yet this subject is usually treated in works of reference under the head of Vital Statistics.

General Principles.—No two members of the same family come into the world in all respects alike, and the original differences grow more instead of less manifest as the younger members advance to maturity. When to the original differences have been superadded others resulting from diversity of climate, food, dwelling, occupation, mental and moral habits, these primary differences become more pronounced. Man is migratory, and it is easy to see how the various members of the human family began to differ from the first stock when they wandered away from their earliest home, to dwell in strange climes, and worship their gods under strange stars. The modifications in colour and general appearance produced by a tropical climate on an Englishman's complexion and physique are specially apparent. He is usually darker than his compeers. As colour is one of the points in which the various races of men depart widely from each other, it should be noted how great are the alterations in this respect that can be effected by ordinary influences, even within the first generation. But with each successive generation these alterations are more and more marked, assuming that the members of the original family can perpetuate their stock under the new conditions of life.

An important question here arises. Are slight differences of organisation among members of a family, either appearing by some occult law at birth, or produced at a subsequent period by various natural causes, transmitted from one generation to another? Two propositions may be safely advanced. (1) The peculiar characteristics of races have been passed on from one generation to another without material change within the historic period. For example, the Jews and negroes on Egyptian monuments three thousand years old are like the Jews and negroes of our own time. (2) Within the limits of the race individuals are constantly deviating from the racial type. If they cannot transmit to, or perpetuate in their descendants these variations, the races of mankind could not have come from one or a few parent stocks, whose descendants by intermarriage, and by individual but transmissible deviations from the family type, became fixed as separate varieties, or, as some used to hold, separate species.

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* *Nouveau Dict. Encyc. des Sciences Medicales.*

Everybody knows that parents and children resemble each other. But though the resemblance may be extremely close to one or to both parents, the rule is, that despite general resemblance, marked differences divide parents and children. They resemble each other most closely in physique and bodily peculiarities, for heredity acts more vigorously on the body than on the mind. The prominent nose of the Stuarts, the thick upper lip of the Hapsburgs, the fulness of the lower parts of the cheek characteristic of the present Royal Family of England, the long narrow face of the Coopers (Lord Shaftesbury's family), the prominent jaws and cheekbones of the Clackmannanshire Bruces derived from the victor of Bannockburn, the curious resemblance between the Wallaces of Cragie and their ancestor Sir William Wallace of Ellerslie, the startling likeness traceable in Lodge's portraits of six generations of the ducal family of Manchester, and coming to a lower stratum of life, the sixth rudimentary finger which adorns the right hand of so many Shetlanders, may be cited as examples of heredity. Edward Lambert, the porcupine man, whose skin was hideous with horny excrescences, transmitted them to five generations of descendants. Bees, ants, and dogs illustrate the hereditary transmission of instincts.

Man illustrates the hereditary transmission of deformities, diseases, intellectual power, and even moral depravity. Mr. Dugdale, a statistician of New York, has shown, for example, that a family called Jukes, numbering 1,200 persons, consisting mainly of thieves, paupers, and malefactors of varying degrees of enormity, who, one way and another, have cost the State in their time £260,000, are all traceable to their grandfather, a descendant of an early Dutch settler. He lived as a backwoodsman on the Indian frontier of New York, and was weak in will, feeble in self-denial, a hard drinker, working only by fits and starts. He became blind, and transmitted his blindness to his descendants. Dr., afterwards Lord Chancellor, Ball, in a speech in the House of Commons (March 21, 1870), showed that there was a hereditary taint of assassination in certain districts in Ireland. Spenser, in his *Faëry Queen*, makes Aberlow Glen the favourite haunt of evil spirits, and to this day the spot is the chosen haunt of the murderous moonlighter. Sir D. F. Galton has written a book to prove that genius is hereditary. But he has only been able to show that what is transmitted in families of distinction is not genius, but rather talents, tastes, a capacity for rising to distinction, a susceptibility to certain influences, and a readiness to respond to certain opportunities. No great poet has yet begotten a great poet, unless, of course, it be taken as proved that King Solomon wrote the Canticles. No military genius ever yet begat a military genius. The son of Ghengis Khan, Timour the Tartar, though a mighty conqueror, was not a genius. Mahomet, Luther, Knox, Calvin, left no children worthy of their renown. Though the Emperor Hunayon was a genius, he was also a lunatic, and his father the Emperor Baber, though of consummate ability, was not what is generally called a genius. Setting aside the two Pitts, there is hardly an instance on record of a statesman of the highest genius finding a rival in his son. The executive ability of the musician, like the interpretative faculty of the actor and actress, is perhaps the quality most easily transmitted, as it is a quality most closely connected with the development of the muscular sense, and of the organs of hearing, of voice, and of touch. Technical skill in handicraft is curiously transmissible. The fourteen Kilians of Augsburg, who were famed as engravers during four generations, the three Vanderveldes, two Teniers, four Vernets, and two Rafaelles, are all cases in point. The persistent vitality of the Brahmins and the Jews show how the most vigorous mental and physical racial peculiarities can be maintained by transmission. As for deformities, many instances could be given of their hereditary transmission. For example, at a meeting of the Société de Biologie, held in Paris on the 17th of April, 1879, M. Brown-Séquard mentioned the history of a man who by an injury had his lower jaw deformed. He transmitted this deformity to his three daughters. He also cited the curious case of a gentleman who had lost the middle finger of the right hand. His son had no defect;

but the latter had two children born to him, in both of whom the finger corresponding to the one their grandfather had lost was missing. In another case adduced by M. Brown-Sequard a man had a finger of one hand amputated, and in a son born four years after the accident two fingers were wanting. He further showed that an acquired defect may lead in the offspring, not to a defect, but an increase in the corresponding part. The offspring of a guinea-pig, in which one toe was cut off, developed a supernumerary toe. M. Rougel, in the discussion of M. Brown-Séquard's paper, mentioned the case of the salamander, in which the amputation of the tail caused two tails to grow in its place.

One cause of deviation from family type is due to the fact that unless the child resembles one or other parent he is a third person altogether who resembles both vaguely, but neither exactly. The transmission of these deviations to, or their fixture and arrest in, his descendants living in some suitable environment will explain how varieties of the human species can originate. At the same time, if these divergent forces were not checked, there would ultimately be no races at all. Humanity would be entirely heterogeneous. The climate of a country in which a race settles tends to check deviation. There is also in Man, as in many animals, a tendency to constantly revert to the original type; the son failing to resemble his parents may thus resemble in the most striking way his grandparents. Aiding this tendency to *atavism*, as it is called, we have the isolation of families, and groups of families called races, produced by caste feeling, by geographical position, by mental, moral, and religious antipathies. Intermarriage within the caste or race, moreover, intensifies heredity, and counteracts the infinite tendency of individuals to deviate from their parent stocks.

With such a law of variability operating during thousands of years, it was inevitable that diverse races should appear both among mankind and the other members of the animated creation now inhabiting the world.

But here we are met by the highest question in Ethnology. Can it be established on strictly scientific evidence that the several types of mankind have had a common origin? Or have they from the first been totally distinct? Before entering on this inquiry, some terms which it will be necessary to employ in the argument must be defined. All who have any acquaintance with natural science have at least a general idea what a *species* means, though modern investigations have rendered it for the present almost impossible correctly to explain it. Till lately, nearly all naturalists held that each species of animals or of plants was produced by a separate act of creation, and that the number could not be increased unless by a fresh exertion of creative power. Then each species we were told could vary within certain limits, and even give rise to *types* which might be mistaken for new species, but were designated *varieties*. Nay, more, there were sometimes crosses, called *hybrids*, between distinct species; these, it was held, could not perpetuate themselves, but speedily died out, unless kept up by new intercommunion between the parent species. Crosses between mere varieties were occasionally termed *mongrels*. These explanations being made, readers will thoroughly understand the nature of the question—Are the several types which we see among mankind *distinct species*, or are they simply *permanent varieties?*

It was formerly held that there was decisive proof derivable from natural science in favour of the unity of the human race. This was the nature of the argument employed:—Hybrids between distinct species are unable permanently to propagate themselves. For instance, the mule, which is a hybrid between the horse and ass, is incapable of continuing its race. If the European and the negro were distinct species, the race intermediate between them — namely, the mulatto—would be a hybrid, and, if left to itself, would speedily become extinct. But any argument based on hybridity rests on an unstable foundation, for the laws governing the production of hybrids, though admitted to be identical in the animal and vegetable worlds, are still badly understood. It is, however, proved that distinct species can be crossed, and not only will they produce hybrids, but hybrids that reproduce each other. Yet the power of reproduction in these hybrids varies strangely. Species that are hard to cross, *i.e.*, which resist the production of hybrids, have produced male and female hybrids that are highly fertile when mated with each other. Species that easily produce crosses produce hybrids that are apt to be sterile. Still, as a rule, the easier it is to produce hybrids between two species, the easier is it for the hybrids to perpetuate their race. According to Darwin, the degree of sterility of first crosses, and of hybrids, is proportionate to the organic affinity of the forms that are united. The species which most closely resemble each other are most easily crossed, and their hybrids exhibit the highest degree of fertility. But even to this law Darwin admits that there are many perplexing exceptions, though the rule is so strong that he says, while species belonging to distinct genera can rarely be crossed, those belonging to distinct families can never be crossed. From this it is easy to infer that the difficulty or the ease with which species can be made to produce fertile hybrids depends, as Darwin puts it, "exclusively on the sexual constitution of the species which are crossed, or on their sexual elective affinity."

The truth is, that living beings are classified by naturalists as the result of a careful study of their whole organisation, not merely of a part of it. When, after a comparison of every organ in the bodies of two living beings, the naturalist decides that they must be classed as separate species, it is only reasonable to suppose that, as a rule, differences exist between those reproductive organs that render sexual affinity impossible. On the other hand, it may be that all the organs may specifically differ in two beings save the reproductive organs, which being thus left in sexual affinity permit of fertile crossing and hybridation. But it is asked why do the different varieties of domestic animals not become sterile, or produce sterile hybrids when crossed? The effect of domestication, however, is to produce sterility, save in species whose reproductive organs are not very sensitive to changes in the conditions of life. Domestic animals, therefore, inherit reproductive powers which remain active after greater changes have been made in their bodies by domestication than even crossing will produce. There is, therefore, no reason why they should produce sterile mongrels. It is too often forgotten in discussing this question that most of our knowledge of hybridism is derived from experiments on plants. But the rule that has an important bearing on anthropology is this:—though hybrids are more easily produced in animals than in plants, they are less fertile when produced.

If then we find fertility in the animal hybrid, the presumption is that the parent stocks could not have belonged to different species. Indeed, it is hardly possible to get positive proof that a perfectly fertile hybrid was ever yet produced by crossing two distinct animal species. Hence, if it can be shown that mixed races are fertile, it would be impossible to contend that the parent stocks belonged to different species.*

The question now arises, are hybrid races permanent? It is a curious fact that the purest race in Europe, the Danes, is not increasing. On the other hand the hybrid between the European and the Red Indian is a growing race in Canada. The coloured population of America resulting from the union of the white and negro races is increasing. The mulatto, in fact, does not die out save in a climate which is bad. To argue that because the mulatto dies out in certain states in America he is the offspring of two distinct species, no more proves the case than the failure of our race to perpetuate itself in India proves that our parent races, Celt, Norman, and Teuton, were distinct species. The Mestizoes of Granada and Paraguay (offspring of Indians and negroes), like the mulattoes of Brazil, show no sign of dying out. The strongest argument in favour of the polygenists, or those who consider that the races of Man came from several distinct parent races, is that within the historic period, *i.e.*, for at least three thousand years, existing races have preserved their distinctive features. But, as human remains have been found in deposits of the first-glacial drift—*i.e.*, in the Quaternary period, three thousand years is merely an insignificant moment in the life of the human race on the earth. That period may have been long enough for the existing varieties of the human species to grow up under the influences of heredity, deviation, intermixture, and external environment. Moreover, primitive man, in the Caliban stage, or just after he emerged from the Caliban stage, could not have developed the arts and institutions by which he could maintain himself against climate and the pressure of environing influences.

The controversy between the monogenists and the polygenists was long embittered by the existence of slavery in America. Slave-owners felt that it would be a balm to their consciences if they could prove that the negro was not a variety of Man, but a species of lower animal. Since the Civil War in the United States ended with the subjugation of the Slave States the discussion has been conducted more calmly, and the views of Darwin have almost extinguished its raging fires. Of course, no Darwinian need be a monogenist. The hypothesis of evolution is quite consistent with the view that Man is the offspring of several species of apes. But, on the other hand, the object of all Darwinians is invariably to diminish, not to increase the number of species.

Differences undoubtedly exist in the various races of Man as regards colour, hair, shape of bones (*See* Plate "Types of Races," Vol. I.), bodily proportions, brain-weight, mental peculiarities. But, on the other hand, the resemblances between them, when we study their organisation as a whole, are even more striking than their differences; especially their differences in points so insignificant that we can hardly believe they could have originated in distinct parent species. "Now," writes Darwin ("Descent of Man," Part I., chap. 7), "when naturalists observe a close agreement in numerous small details of habits, tastes, and dispositions between two or more domestic races, or between merely altered natural forms, they use this fact as an argument that all are descended from a common progenitor, who was thus endowed; and consequently, that all should be classed under the same species."

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* M. Quatrefages showed that hybrids gotten by two species of moths (*Bombyx cynthia* and *B. arsindra*), were fertile for eight generations. Darwin proved that hybrids from the common goose and the Chinese goose (*Anser cygnoides*), which some think belong not merely to different species but to different genera, are fertile.

The next question for consideration is, if Man originated from one, or even if he originated from more than one, parent stock, what were his progenitors like? Those who advocate the view that the various orders of living beings were the results of successive acts of special creation hold with Agassiz, that Man "is the end towards which all the animal creation has tended from the first appearance of the first Palæozoic fishes." The Darwinians, on the contrary, maintain that Man as well as the man-like apes have descended together from some still more ancient and extinct form of animal. Darwin holds that this creature, though doubtless differing vastly from any existing form of ape, would, if found, be classed unhesitatingly among the Catarhine or Old World monkeys. Mr. St. George Mivart, a distinguished Roman Catholic naturalist, carries the hypothesis still farther; for whilst he thinks that the body of man is the result of natural evolution from a lower form, it is a body which enshrines a soul that could only have been the result of a supernatural creation ("Genesis of Species," 1881). From a scientific point of view, the objection to the hypothesis of special creation is that it does not rest on the basis of proof on which all other scientific hypotheses are founded. Scientific men say that it is not an hypothesis but a dogmatic assertion to aver that we need look no farther than the sacred books containing the revelations of religion for a correct account of Man's origin—an account that explains very few of the facts of comparative anatomy. The derivative hypothesis, on the other hand, accounts for most of them—*e.g.*, the resemblances between Man and animals in various embryonic stages; the existence in Man and animals of homological structures—*i.e.*, organs which, though differing in function, can be structurally identified, as, for example, the human arm and the fore leg of the quadruped or the wing of the bird; the survival in Man, as in other animals, of rudimentary structures not only useless, but possibly hurtful, because they are liable to disease, which structures exist as useful organs in lower forms. It is also contended that there is no obvious difference, bodily and mental, between the highest ape and the lowest savage to render the hypothesis of a common origin impossible.

A like question is whether Man is the descendant of a higher or a lower type of humanity than now exists on the earth. In other words, was "primæval Man" a savage? Nothing is positively known of the condition of primæval Man. The ancient poets believed that Mankind rejoiced in an earthly paradise—a golden age shrouded from our eyes by the grey mists of antiquity. The Laureate of to-day, on the contrary, exclaims—

> "What stuff is this!
> Old writers pushed the happy seasons back—
> The more fools they, we forward . dreamers both."

Perhaps the best way of putting the question is this: which of the races known to us most probably resembles Mankind "in the beginning?" Many scientific men believe, that as evolution in structure is from the lower to the higher type, it is so also as regards civilisation and religious ideas. Hence they take it for granted that the civilisation, such as it is, of the lowest savages most closely approximates to the civilisation attained by primitive Man. A race which cannot make a piece of pottery is thus held to be much more likely to resemble the parent race or races of Man than one that can make pottery. A race that shapes its pottery by hand entirely must more closely approximate to primæval Man than one which shapes it by the wheel. As Mr. Andrew Lang says, "the anthropologist is inclined to infer that the religious ideas of peoples which are comparatively 'near the beginning' of the arts of life must be earlier than the religious ideas of peoples which have long acquired the arts of life." * There is, however, another side to the question.

It is not necessary to suppose that the lowest savages have never advanced far beyond the beginning of things. They may have fallen from a higher state, and even the higher races may themselves be but the degenerate progeny of Man in the Mosaic Paradise, or in the Golden Age of Paganism. To Professor Max Müller and many other scholars we are indebted for much knowledge, not only of the contents, but of the vast and far-reaching antiquity of the Vedas—especially the Rig-Veda—or Sacred Scriptures of the Hindoo Brahmins. It is beyond dispute that Professor Max Müller has a right to describe the Rig-Veda as a collection of the religious or devotional hymns of a race far advanced in civilisation. Professor Max Müller accordingly asks, why look to the Hottentots or Australian aborigines of to-day for the religious ideas and civilisation that are nearest to those of

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* *Folklore Journal*, Vol. I., p 108.

Man in the beginning? Surely, he argues, the amazing antiquity of the sacred books of the long extinct and unrecorded races that sang the Vedic hymns gives ground for belief that their civilisation and religious ideas are nearer those of the first generations of Man than the barbarous superstitions and customs of the lowest of existing savages. Unfortunately the Vedas can be put in evidence on the other side. They contain, or rather retain, allusions to savage ideas and customs which suggest that even Vedic Man had a far-stretching past behind him; for it is as hard to believe that he would have appropriated some of those ideas and customs from contemporaneous barbarism as that Christian missionaries in Africa would be likely to introduce cannibalism into the rites of the Church. Oddly enough these relics of savage ideas and customs in the Vedas are found among existing savages. According to Mr. Lang, "the cosmological myths, the deluge myth, the myth of the stars, the wilder adventures of the gods, the myths of death, the belief in evil spirits, the myths of fire stealing, which we find in the Veda, and still more in the Brahmanas, may all be paralleled in the mythology of Tinnehs, Nootkas, Murri, Thlinkeets, Tacullies, Papuans, Eskimo, and others of the lowest races."* It is, however, right to say that, in the Aryan or Vedic myths, gods usually, though not always, play parts taken by animals in contemporary savage myths; and whenever an animal is an actor in the Vedic myth we are told the creature is a god in animal disguise. Moreover, the savage myths are most conspicuous in the Brahmanas, which are later than the more highly spiritualised Vedas, though even in the Vedas these myths occur. The truth seems to be that Professor Max Müller's argument only throws the savage period of the race farther back than most people would have ventured to put it. If it could be proved from some ancient writing or sculpture that twenty thousand years ago a race existed that invented the steam engine, whilst at the same time writing or sculpture showed that this race retained traces of the customs and beliefs of contemporary savagery, it would not show that the original state of Man was one of civilisation. It would only show that the beginnings of Mankind, or the savage period of the race as a whole, must be ante-dated by at least twenty thousand years. It would show that if Man began his career in a paradise of prehistoric civilisation, he must afterwards have passed through a purgatory of barbarism before his first achievements in civilisation crept into the historic record.

BOOK-KEEPING.—I.

ACCOUNTS—DEBIT AND CREDIT—DOUBLE ENTRY—PERSONAL AND PROPERTY ACCOUNTS.

BOOK-KEEPING is the art of recording business transactions in a *systematic manner*, so as to show not only what has taken place, but also, at any time, what profit or loss has been made, and what is the state of affairs. By the state of affairs we mean the existing debts and other obligations of the business on the one hand; and on the other its property and its claims. The art of book-keeping is the art of *constructing a set of accounts.*

An *Account*, in a book-keeping sense, is a written statement of the business transactions which have taken place between two persons, or which have arisen in dealing in any species of property. The details of an account may be many or few, and the descriptive portion much or little. It is very often expressed in money, but not by any means always so. The word account implies, by its roots, the counting up, reckoning, or computation which is the essential feature of such statements. The simplest form of account is a mere recital, in the order of date, of such transactions as have occurred, the amount of each successive transaction, in money, time, or otherwise, being added to or subtracted from what has gone before. Thus the arrangement of the following items constitutes them a simple account:—

		£
Jan^{y}. 1.	Sold goods to John Jones of Manchester, on trust	127
Feb^{y} 3.	—Sold more goods to him, on trust .	123
	(Owing by him at this date)	250
Feb^{y} 12.	—Received cash from him *on account*, *i.e.*, in part payment	50
	(Now owing by him)	200
Feb^{y}. 15.	—Received back from him a certain portion of the last lot of goods . .	20
	(Leaving due from him)	180
Mch. 20.	—Received from him a further payment on account	80
	(Reducing the amount due from him to)	100
May. 22	—Collected, at his request, an amount due to him by Samuel Smith, one of his London customers	30
	(Further reducing amount due from him to)	70
June 15.	—Received from him another payment on account	50
June 30,	the end of the half-year, when the books are closed, there is still outstanding as a debt due by him . .	20

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* *Folklore Journal*, Vol. I., p. 112.

Such a form of account, however simple, clear, and natural it may be, would be found in practice to present serious disadvantages. As a mere statement to be handed to John Jones, the formal additions and subtractions, when done by the hundred or the thousand, would be cumbrous, and occupy a great quantity of space; and, as will at once be seen, quite uselessly so. In the multiplicity of accounts in actual book-keeping, these disadvantages would be multiplied and intensified intolerably, besides which one of the most convenient tests of the accuracy of the clerical work with which a set of accounts has been constructed —a test of the highest value when the accounts are very numerous—would be lost. Experience has shown that the best way of framing the above account, especially for book-keeping purposes, is to group the items into two classes, the incoming of property distinguishing one class, and the outgoing of property the other. By the words incoming and outgoing must be understood incoming and outgoing to and from John Jones, the person whose account is being framed. The form of his account is divided by a vertical line into halves—one for property incoming to him, and the other for property outgoing from him. The items given above may now be re-arranged into an account of a more approved fashion, as under.

JOHN JONES, MANCHESTER.

Incoming to him.] [*Outgoing from him.*

1889.		£	s.	d.	1889.		£	s.	d.
Jan. 1	Goods - - - - - -	127	-	-	Feb. 12	Cash - - - - - -	50	-	-
Feb. 3	Goods - - - - - -	123	-	-	,, 15	Goods returned - - -	20	-	-
					Mch. 20	Cash - - - - - -	80	-	-
					May 22	Cash from S. Smith - -	30	-	-
					June 15	Cash - - - - - -	50	-	-
							230	-	-
					June 30	Balance carried down -	20	-	-
		250	-	-			250	-	-
July 1	Balance brought down -	20	-	-					

The first side of an account in this form—the side on which incoming property is recorded—is technically called the *debit* side; and the second side—or "outgo" side—the *credit* side. In the widest meaning of the roots of the word debit ("have from") the term as used in book-keeping is not altogether inappropriate; but the student must at once free his mind of the popular and restricted meaning attaching to "debit," viz., that of debt. The term, as used in book-keeping, often covers debt, because, as in John Jones's case, goods are often sent by the business to a customer who does not at the same time pay for them; but it quite as often signifies payment or the cancellation of debt. This will be explained fully by-and-by; meanwhile, the caution we give as to the enlarged significance of the term "debit" should be observed most carefully. The companion and correlative term "credit," which always carries the exactly opposite meaning to debit, is less likely to lead to confusion or misunderstanding, but its application should be attentively studied. What, in popular phraseology, is expressed as giving a man credit, requires us, in book-keeping phraseology, to debit him; when the customer settles, and so closes his account, then, in the phraseology of book-keeping, he gets credit. These opposite and contradictory uses of the same word prove the necessity of getting clearly into one's head what the words debit and credit, in their technical use, denote. Debit once more, then, denotes the *receipt* of property, and credit the *parting* with it.

The term "*balance*" implies, of course, the arithmetical difference between the two sides of the account, and represents the state of the account when, as the phrase goes, "the balance is struck." The diagonal line drawn across the blank portion of one side of the account is drawn to prevent the improper insertion of further items after the account is balanced off.

The word account is often written "A/c," the words debtor and creditor "Dr" and "Cr," and the word balance is often contracted into "Bal."

The method followed in the construction of

Jones's account, in its more approved form, is a method followed in the construction of all personal accounts—*i.e.*, accounts for persons having dealings with the business. John Jones's receipts of property *from* the business are recorded on the first or debit side of his account, and all his transmissions of property (mostly cash) *to* the business on the second or credit side; and the rule for constructing his account is the rule for all personal accounts: debit what is received, and credit what is given up.

The student may not, on first reading the rule, catch its full significance. A careful perusal of the terms in which it is expressed will convince him that in this rule every transaction in business with anyone is regarded as a transfer of property or of something having a money value, and as therefore involving a transferrer, who transfers the property, and a transferree to whom the property is transferred. A remarkably perfect system of book-keeping has been discovered, based on the recognition of the obvious fact that there can be no transferrer to part with property without a transferree to receive it, and no transferree to receive property without a transferrer to part with it. The completeness of this system is attained by having accounts for both the parties to a transaction, of which two parties the business is usually one, and recording the transaction as looked at from both sides—on the one side as a receipt of property, and on the other side as a surrender. It is to this excellent system that we now invite the thoughtful attention of our readers.

The recognition of the two parties to every transaction, and the consequent record of the transaction from both points of view, leads in every instance to the adjustment of two accounts. In the case of a simple transaction, standing by itself, and apart from all others like or unlike it, two entries are actually made in the two accounts concerned, one in each. Thus, in the transaction with Jones on the 1st of January, *i.e.*, in the sale of goods to him on trust, there is a transfer of property, viz., of goods worth £127, from the business to Jones. The former is the transferrer, the latter the transferree, in the transaction. To record the transaction from both points of view requires that we should have two accounts open, one for the business and one for Jones; the entry in Jones's account being, as above, an entry on the debit, or receipt, or incoming side, to denote that he is the recipient of the property; and the entry in the account for the business being an entry on the credit, or issue, or outgoing side, to denote that the business has given up, surrendered, or transferred the property.

One thing will immediately strike the reader, namely, that the business would not be conveniently represented in all transactions by one and the same account. The receipts and payments of cash, the purchases and sales of goods, the receipt and issue of bills of exchange, the acquisition and disposal of property generally, and the very many other transfers arising in business, could not, with the least prospect of usefulness, be allowed to become all muddled and confused together in one great account. Transfers of essentially different natures or kinds must be dealt with in different accounts. In such a transaction as that of the preceding paragraph the business would be represented by an account set apart for the record of goods bought and sold. The transaction in question would therefore be registered in two entries, one introduced into Jones's account and the other into the business account of goods.

To take another illustration. The transaction on the 15th of February, in which there is a return of goods disapproved of and rejected, is, in its nature, the converse of the one just treated of. There is again a transfer of property, viz., goods charged for as worth £20, but the transferrer and the transferree have changed places; Jones is now transferrer and the business transferree. There are again two accounts concerned, the same two as before, the one that was formerly debited, to denote the receipt of property, being now credited, to denote the surrender or return of a portion of that property; and the one that was formerly credited, to denote the surrender of property, being now debited, to denote the reception of a portion of it back again. The business is again represented by its goods account, and the two entries involved in the book-keeping appear in the same two accounts as before, one in Jones's account and one in the business account of goods.

One other illustration only. On the 12th of February Jones pays £50 off the debt he then owes. Here again is a transfer of property, viz., of cash, and here again appear a transferrer—Jones—and a transferree—the business. The business in this case is represented by an account usually called the cash account, Jones being represented by his own account, as before. Two entries are required to completely register the simple transaction before us, one of them being inserted in the business account for cash, and the other in the personal account for Jones.

The fact that in any complete system of book-keeping there must be for every simple transaction, taken alone, two entries in the accounts of the business, has occasioned such a system to be known as Book-keeping by Double Entry. This title, however, is misleading to those unacquainted with the actual process of such a method of book-keeping, and is apt to create an impression that every individual transaction is recorded twice over, *i.e.*, in two separate and distinct entries special to that transaction, and that there is, consequently, twice as much work absorbed in the process as is absolutely necessary to register the bare facts. Such, we may say at the outset, is an altogether wrong impression, as the student will soon perceive.

A much more suggestive title, and one far less likely to create an incorrect notion of the peculiar feature of a complete system of book-keeping, would, we think, be Book-keeping by Equal Debit and Credit. By way of example, we may point out that in the case of the transaction with Jones on the 1st of January, we debit £127 in Jones's account and credit the same amount in the business account for goods. In the case of the transaction on the 15th of February we debit £20 in the goods account and credit the same amount in Jones's account. In the case of the transaction on the 12th of February we debit £50 in the business account for cash and credit the same amount in Jones's account. Whatever the transaction may be, and whatever abbreviations and contractions may be resorted to —and they are many and great—this equality of debit and credit is the one universal principle of complete book-keeping; and any complete system of book-keeping may, as we have said, not inappropriately be entitled Book-keeping by Equal Debit and Credit.

The business accounts for goods and cash, containing merely the entries answering to those already shown in Jones's account, are given below.

Very special attention should be given to the distinctive *feature of the system*, which is the creation of a number of accounts collectively representing the business, and each of which represents a certain well-defined portion of the business; or, to speak with more precision, embraces a certain well-defined class of the business transactions. Of the two parties to a transfer of property in which the business is concerned, the business is usually either transferrer or transferree. It follows that if a single account only were introduced to represent the business the entries in it would approach in number the transactions of the entire business. There would be a confused record of many kinds of transactions, simple and complex, in various kinds of property, rendered still more confused by the interpolation of miscellaneous profits, and possibly miscellaneous losses. Such an account would be a chaos from which no order could arise—a mass of heterogeneous details thrown together haphazard, and collectively signifying nothing. The merit of the system of book-keeping now to be set forth consists in the successful solution of this chaotic and meaningless account into a number of separate accounts, each presenting an orderly record of all transactions of a particular group, and giving, by means of the balance, information desirable in the management of a small business, and indispensable in the supervision and control of a large one.

We proceed to illustrate what we have said up to this point, commencing with the consideration in detail of a few simple but typical transactions involving only personal accounts and property accounts—*i.e.*, accounts for persons as above, and

GOODS.

1889		£	s.	d	1889.		£	s	d.
Feb. 15	Returned from John Jones	20	-	-	Jan. 1	Sold to John Jones - -	127	-	-
					Feb. 3	Do. - -	123	-	-

CASH.

1889.		£	s.	d.	1889		£	s	d.
Feb. 12	John Jones - - - - -	50	-	-					
Mch 20	Do. - - - -	80	-	-					
May 22	Do., per S. Smith -	30	-	-					
June 15	Do. - -	50	-	-					

accounts of cash, goods, buildings, and other kinds of property.

Jany. 1.—Wm. Wykeham begins business with £1,000 in cash, advanced to him this day by his father, Wm. Wykeham, Senior.

Here the property transferred is cash; the transferrer is Wm. Wykeham, Senior, and the transferree, or receiver, is the business. We have, therefore, to debit an account representing the business, and to credit an account for Wm. Wykeham, Senior. We shall name the particular business account "cash." The cash account will be an account set apart for all receipts and payments of cash.

Jany. 2.—Bought of Alexander Arrowsmith a quantity of wine, owing him £250.

Here the property transferred is wine; the transferrer is Alexander Arrowsmith, and the transferree, or receiver, is again the business. We have, therefore, to debit an account representing the business, and to credit an account for Alexander Arrowsmith. We shall name this second business account wine, and we shall reserve it for all receipts and issues of wine.

Jany. 3.—Paid cash to Alexander Arrowsmith in settlement of his account, £250.

Here the property transferred is cash; the transferrer is the business, and the transferree is Alexander Arrowsmith. We have, therefore, to debit Arrowsmith's account, and to credit the account representing the business, which in this case will be the cash account.

Jany. 4.—Bought of Alexander Arrowsmith a quantity of wine, and paid him for it in cash, £200.

This is not a single transaction, like those previously given, but a double one. The item refers to two transfers of property, instead of one—firstly, the transfer of wine, and secondly, the transfer of cash. Theoretically, each transfer is treated independently of the other. The first transfer is of the same nature as that of Jany. 2, and requires the wine account to be debited and Arrowsmith's account to be credited; the second transfer is of the same nature as that of Jany. 3, and requires Arrowsmith's account to be debited and the cash account to be credited.

We may remark that, in actual book-keeping, Arrowsmith's account would often be omitted in such circumstances as the present—*i.e.*, in the circumstances of a cash purchase. It must be borne in mind, however, that for the moment we are trying to illustrate the principles of book-keeping, not its contractions.

Jany. 5.—Sold to Benjamin Brown, at cost price, a quantity of wine, for which he owes £100.

We say at cost price because we wish to defer all consideration of profit or loss till a little farther on. Here the property transferred is wine; the transferrer is the business, represented by its wine account, and the transferree is Benjamin Brown. We have, therefore, to debit Brown's account and to credit the wine account.

Jany. 7.—Received cash from Benjamin Brown in payment, £100.

Here the property transferred is cash; the transferrer is Benjn. Brown, and the transferree is the business, represented by its cash account. We have, therefore, to debit the cash account and to credit Brown's.

Jany. 8.—Sold to Benjamin Brown a further quantity of wine, also at cost price, and received cash in payment, £50.

This is another double transfer—a transfer of wine coupled with a transfer of cash. The former requires us to debit Brown's account and credit the account for wine, and the latter to debit the cash account and to credit Brown's.

Jany. 9.—Opened a banking account at the Bank of England, paying in £650.

Here cash is removed from the custody of the business, or the proprietor or manager or cashier of the business, and placed in the custody of the bank. The bank, however, has to pay it out when and as it is instructed so to do. The control of the cash, therefore, remains with the business, and does not pass over to the bank. The bank is merely another cashier appointed to hold cash and conduct cash transactions in behalf of the business. It is consequently to be regarded in business as the representative of the business, and its account may be regarded, like the account for other cash belonging to the business, as one of the business accounts.

The transfer of cash which takes place here is then not so much a transfer between the business and an outsider as a transfer from one account representing the business to another account also representing the business. A portion of the cash standing in the books under the head of "Cash" is to be accounted for in future under the head of "Cash at Bank of England." Therefore, we have to debit the Bank of England cash account and credit the ordinary or office cash account.

ENGLISH.—IX.

[*Continued from p.* 104.]

PERSONAL PRONOUNS (*continued*).

EXERCISE 9.

In the following passage you will find many examples of personal pronouns, and will be able to illustrate the rules we have given above:—

AN APARTMENT IN YOUNG HONEYWOOD'S HOUSE.

Enter SIR WILLIAM HONEYWOOD AND JARVIS.

Sir William. Good Jarvis, make no apologies for this honest bluntness. Fidelity like yours is the best excuse for every freedom.

Jarvis. I can't help being blunt, and being very angry too, when I hear you talk of disinheriting so good, so worthy a young gentleman, as your nephew, my master. All the world loves him.

Sir Will. Say, rather, that he loves all the world; that is his fault.

Jar. I'm sure there is no part of it more dear to him than you are, though he has not seen you since he was a child.

Sir Will. What signifies his affection to me, or how can I be proud of a place in a heart where every sharper and coxcomb finds an easy entrance?

Jar. I grant you that he's rather too good-natured; that he's too much every man's man; that he laughs this minute with one, and cries the next with another; but whose instructions may he thank for all this?

Sir Will. Not mine, sure! My letters to him during my employment in Italy taught him only that philosophy which might prevent, not defend his errors.

Jar. Faith, begging your honour's pardon, I'm sorry they taught him any philosophy at all, it has only served to spoil him. This same philosophy is a good horse in the stable, but an arrant jade on a journey. For my own part, whenever I hear him mention the name on 't, I'm always sure he's going to play the fool.

Sir Will. Don't let us ascribe his faults to his philosophy, I entreat you. No, Jarvis, his good nature arises rather from his fears of offending the unfortunate than his desire of making the deserving happy.

Jar. What it arises from I don't know. But, to be sure, everybody has it that asks it.

Sir Will. Ay, or that does not ask it. I have been now for some time a concealed spectator of his follies, and find them as boundless as his dissipation.

Jar. And yet, faith, he has some fine name or other for them all. He calls his extravagance, generosity, and his trusting everybody, universal benevolence. It was but last week he went security for a fellow whose face he scarce knew, and that he called an act of exalted mu- mu- munificence; ay, that was the name he gave it.

GOLDSMITH: "THE GOOD-NATURED MAN."
(Act. I., Sc. 1.)

Reflexive Pronouns.—When a pronoun in the accusative or any oblique case refers to the subject of the main verb in a sentence, it is called ***Reflexive.*** There are no distinct forms for the reflexive pronoun in English. In early English the ordinary personal pronouns served as reflexive pronouns, and they still do so in archaic or poetic language. You will find many examples of this use of the personal pronouns in Shakespeare and earlier writers. Examples:—

> "I do repent *me.*"
> "Sit *thee* down."
> "How she opposes *her* against my will."
> "Here will we rest *us.*"
> "Then come back hither and avenge *you.*"
> "They sate *them* down upon the yellow sand."

But very early the reflexive was strengthened by the addition of ***self.*** This word is in reality an adjective meaning "same," and in early English it agreed with the pronoun to which it was joined. Thus, "I self," "me self," were once commonly used. Then the dative case of the pronoun was put before *self,* and this still remains in ***himself, themselves, him*** and ***them*** being datives. Soon, however, the genitive forms *mi, thi, your,* &c., were prefixed to *self* and after "mi-self," "your-self," &c., had been used for some time, "self" soon got to be looked upon as a noun. In modern English, indeed, it very frequently has the force and follows the construction of a noun. In the following examples the substantive use of *self* is emphasised:—

> "To thine own *self* be true."
> "Thy crying *self.*"
> "Our gross *selves.*"

You will be able to find for yourselves in any book which you chance to be reading plenty of examples of "myself," &c., used as reflexive pronouns. We shall only give you one or two here:—

> "I could only keep *myself* alive by rambling up and down the vault."
> "He was confident in *himself.*"

Myself, &c., are often added to the nominative of the personal pronouns for the sake of emphasis: *e.g.*—

> "I was so angry *myself* that I did give him a tip over the side."
>
> "Colonel Mannering had made not the slightest motion to invite him to sit, and indeed had remained standing *himself* during their short interview."

In the two last quoted sentences ***myself*** and ***himself*** have the force of "for my part," "as far as he was concerned."

It rarely happens that ***myself, himself,*** &c., are used emphatically without any pronoun preceding them: *e.g.*—

> "Direct not him, whose way *himself* will choose."

While we are discussing the pronouns compounded with "self," there is one other usage to which attention may be called. "By myself," "by himself," &c., have the idiomatic meaning of "alone," "unaided": *e.g.*—

> "I went into the town *by myself.*"
> He achieved his object *by himself.*"

(ii.) *Possessive or Adjective Pronouns.*

The possessive pronouns may be divided into two main classes:—(1) Attributive, (2) Unconnected or Absolute.

(1) The Attributive possessive pronouns are *my, thy, his, her, its, our, your, their*, and are used like adjectives, and generally precede the noun they qualify. Their etymological history is as follows: —They were formed from the genitive of the personal pronouns, and in early English they had inflections of number, case, and gender, like other adjectives. These inflections, however, have long since been lost, and they are now invariable.

The genitives of *I* and *thou* in early English were *min* and *thin* respectively, and from these genitives the possessive pronouns *mine* and *thine* were derived. The final *e* has no force, and merely indicates that the *i* is to be pronounced long. *My* and *thy* are nothing more than abbreviations of *mine* and *thine*, but it is a noteworthy fact that they have almost driven the longer forms out of the language. There is, of course, no difference of meaning between the longer and shorter forms, and euphonic considerations generally determine which should be used in particular instances. In modern conversational English *mine* and *thine* are never used, but they are sometimes met with in poetry and rhetorical language. In Shakespeare's time the two forms were interchangeable, but the longer form (*mine, thine*) was generally to be found in the following cases:—

(*a*) Before a vowel: *e.g.*—

> "Give every man *thine* ear and few *thy* voice."

(*b*) If the noun preceded the possessive pronoun, *mine* and *thine* were used. Instances of this arrangement of words are chiefly met with in addresses, in which *mine* follows the title of the person addressed—*e.g.*, "brother *mine*," "father *mine*."

(*c*) In a few stereotyped phrases such as "mine host" we find *mine*, where *my* would be expected. "Mine host" is met with in Shakespeare, and in modern English has become so common as to seem a vulgarism or piece of affectation.

His is nothing more than the genitive of *he*, and in early English was regarded as this genitive, and not as a possessive pronoun. There is little to remark in its use, except that up to the time of Shakespeare it was neuter as well as masculine. As you will see presently *its* is a comparatively modern word, and was not much used before the end of the sixteenth century. Example of *his* used for *its*:—

> "And the earth brought forth grass, and herb yielding seed after *his* kind."

A common abbreviation of *his* is *'s*: *e.g.*—

> "There's not a hair on 's head."

Following a noun, *his* is sometimes taken to represent the genitive case. This was once so common that the older grammarians jumped to the conclusion that the genitive suffix *'s* was nothing more than an abbreviation of *his*. However, that this is not the case you have already learned. Examples:—

> "Bill Stumps *his* mark."
> "Saint Thomas *his* church."

Her is also a genitive, its old English form being *hire*. It is sometimes in the poets used where we should rather use *its*, but generally when the noun to which it refers is personified. Example:—

> "Since my dear soul was mistress of *her* choice."

The history of the word *its* is extremely curious. It seems so simple and so necessary to the spoken as well as written language that it is quite hard to realise that it is a comparatively modern word. Yet it was never used by the translators of the Authorised Version of the Bible, it is rarely found in the writings of Shakespeare and his contemporaries, and it cannot be said to have been properly established until the seventeenth century. In the time of Shakespeare, either *his* or *it* was used for *its*. In the few passages of Shakespeare's plays in which *its* is found the reading is open to dispute. Examples of *his* for *its*:—

> "And that same eye, whose bend doth awe the world,
> Did lose *his* lustre."
> "It shall bruise thy head and thou shalt bruise *his* heel."

Examples of *it* used where in modern English *its* would be written:—

> "That nature which contemns *it* origin,
> Cannot be bordered certain in itself."
> "The hedge-sparrow fed the cuckoo so long,
> That it 's had *it* head bit off by *it* young."

Our, your, their. The possessive pronouns which correspond to the plural substantive personal pronouns present no difficulty. They were all originally genitives. *Our*, like *us*, is used by royal personages, editors, and others, when only one individual is referred to. Examples of this will be found above in the lesson devoted to the substantive personal pronouns (p. 102). Similarly, *your* is generally used when only one person is spoken of, *thy* being reserved for Quakers and for rhetorical address, just as you have seen *thou* is.

An old-fashioned abbreviation of *our* is *'r*. This is found in "by *'r* lady," and other expressions.

Further emphasis may be given to possessive pronouns by adding *own* to them—*e.g.*, "my own," "your own," &c.

(2) The Unconnected possessive pronouns are *mine*, *thine*, *his*, *hers*, *its*, *ours*, *yours*, *theirs*, and are called unconnected because they are used without any noun following them. They resemble in their use the French *le mien*, *le tien*, &c. : *e.g.*—

"My father and *yours*."
"His books and *mine*."

Hers, *ours*, *yours*, and *theirs*, are double genitives. *Her*, *our*, &c., are, as we have seen, genitives already, and the common genitive suffix *'s* is added to them. You will notice that, when unconnected, *mine* and *thine* may never be abbreviated to *my* and *thy*. In some dialects of English we find the forms *hisn*, *hern*, *yourn*, &c.

"He that steals what isn't *hisn*,
When he's caught he goes to prison."

These forms, now characteristic of illiterate English, were not always vulgarising, but existed in old English as *heren*, *ouren*, &c.

In the older poets there is a curiously irregular use of the unconnected possessive pronoun. It sometimes precedes the noun which it qualifies, when that noun is qualified by an ordinary possessive pronoun as well. Example :—

"What to come is *yours* and my discharge."

If the order of these words were inverted, and we read "my discharge and yours," there would be nothing irregular in the sentence.

There yet remain to be considered a few rules which apply equally to all the possessive pronouns.

(*a*) The possessive pronouns, as no doubt you have already gathered, not only in form but also in meaning, do not greatly differ from the genitive case of the substantive personal pronoun. Thus, logically, there is no great distinction between "my" and "of me." In the general usage of the language, however, it is understood that "my" implies a subjective, "of me" an objective relation. As the words "objective" and "subjective" are somewhat vague, an example may perhaps make this distinction clearer to you. If you compare the two sentences—

"*My* fear causes me to shudder,"
"The fear *of me* drove him from the room,"

you will notice that in the former *I* am the subject of the fear, "*I* feel fear and therefore shudder;" in the latter *I* am the object of fear, "He was afraid of *me* and therefore left the room."

This, we hope, will make clear the difference between subjective and objective, and enable you to understand what the difference is between *my* and *of me*. However, this distinction is sometimes lost sight of, especially in some few colloquial phrases. Examples :—

"I couldn't for the life of *me* understand what he meant.'
"You'll be the death of *me*."

(*b*) The possessive pronoun being equivalent to the substantive personal pronoun preceded by *of*, it is quite natural that a possessive pronoun may be followed by a relative which refers back to the substantive personal pronoun implied in the possessive. This, perhaps, will be difficult for you to understand until you have learned something of the relative pronoun ; but if you find it not easily intelligible, you can omit this paragraph and return to it when you have learned something of the relative. This construction is not common, and is only admissible in language which is rhetorical or archaic in style. Examples :—

"If you had known *her* worthiness *who* gave the ring," &c.
"How hard is *our* fate
Who serve in the state."

(*c*) Some of the pronouns have a curious force, and express respect or contempt. For instance, *my* and *our* are used in addressing persons of high rank. Example :—

"*Our* Lady Queen Victoria."

Your on the other hand denotes something despicable. Example :—

"There was one of *your* miserable flunkeys at the gate."

(*d*) The possessive pronouns are used with some adjectives, especially when they are of the comparative or superlative degree. For instance, we say "*my* elder brother," "*his* better half." In addresses the possessive pronoun is frequently joined with the superlative—*e.g.*, "*My* dearest father," in beginning a letter, &c. Similar to this is the use of the possessive pronouns with neuter adjectives. Examples :—

"Take him for all in all,
We shall not look upon *his* like again."
"The ruffian ran *his* fastest down the road."

(*e*) By a curious idiom we sometimes find "of" with the unconnected possessive pronoun used instead of the attributive—*e.g.*, "that hat *of yours*." The explanation of this idiom is simple. The object referred to is regarded as one of a class ; "that hat of yours," for instance, means "that particular one out of your many hats." But the form of expression being once stereotyped, its origin was lost sight of, and we find it used of objects which cannot be got within a class. Example :—

"Will not a calf-skin stop that mouth *of thine*."

(*f*) In two cases the possessives are used absolutely, and refer to no definite noun. The neuter singular of the possessive is used to denote that which belongs to one. Example :—

"He clung with great pertinacity to *his* own."

This idiom is extremely common in formal business correspondence—*e.g.*, "*Yours* of yesterday to hand."

When the unconnected possessive is used indefinitely, it means "relatives" or "friends"—*e.g.*, "You and *yours*," "they and *theirs*."

OMISSION AND REPETITION OF THE POSSESSIVE PRONOUNS.

The possessive pronoun is not often omitted. But in a few cases, especially in colloquial language, where confusion is not likely to occur, its omission may be noticed. Examples :—

"*Father* has gone to market."
"*Mother* is in the orchard."

Similarly servants, in speaking of their master and mistress, generally describe them as *master* or *mistress* without any article.

If one possessive pronoun refers to more than one noun, it may be repeated before each or only stated before the first. There is no hard and fast rule to be laid down, but perhaps it is more common not to repeat it. We may say either "My father and mother," or "my father and my mother."

II. DEMONSTRATIVE PRONOUNS.

The demonstrative pronouns point to persons or things, and express their nearness or their distance from the person speaking. They are—

This, that, yon, yonder, such, same, so,

This and *that* have different forms for the plural (*these* and *those*), but the demonstrative pronouns have no other inflections of number, case, or gender.

1. *This*, pl. *these*. In old English *this* had separate forms for all three genders; but *this*, which was originally only the neuter form, began to be used for the masculine and feminine as well towards the end of the fourteenth century. It is used both as an adjective and a substantive.

(*a*) The characteristic use of *this* is to refer to an object or thing which is near to the speaker or present to his mind; it therefore may point to something which has just been spoken of or is about to be spoken of. Examples :—

"The King will come by *this* way."
"*This* earth is rich in man and maid."
"At *this* instant a shout was heard from the beach.
"Such a night as *this* I trusted never to live to see."
"The ball having hit the yard in the slings, the mainsail fell upon deck. The consequence of *this* accident appeared inevitable."

"*This* is fixt
As are the roots of earth and base of all,
Man for the field and woman for the hearth."

With regard to time, *this* refers naturally to the present. Thus we say, "I saw your father *this* morning." "I have not seen such a sight *this* many a year."

(*b*) Sometimes *this* is used for something which is not near to the speaker. It then expresses a sort of contempt or dislike. Example :—

"We love not *this* French God, the child of Hell,
Wild War, who breaks the converse of the wise."

(*c*) *This* is often used substantivally, to denote some place or point of time. Examples :—

"Him I accuse
By *this* the city ports hath entered."
"Between *this* and Oxford Street."
"Did you come to that conclusion long ere *this?*"

(*d*) The following is another substantival use of *this*. It is used generally in conjunction with *that*, after titles such as "Mister," "My Lord," when the speaker affects not to know the name—"Mister *This* or *That*"; "My Lord *This*, my Lord *That*."

(*e*) The singular and plural of *this* are sometimes confused. *This* is found where we should expect *those*, when the idea expressed by the plural noun is singular; and similarly *these* stands for a singular noun when more than one person or thing is referred to. Examples :—

"I have lived in this town *this* fifteen years."
"I will give you *this* five guineas if you obey my orders."
"*These* kind of people are despised by all honest men."

2. *That*, pl. *those*. The following are the principal uses of *that*. (*a*) It refers to an object or person which is remote from the speaker. This is its more characteristic use. But it is also somewhat loosely employed with very much the same force as *this*, to denote something which has just been referred to or is about to be referred to. Examples :—

"Who is *that* fellow over there?"
"A less vivid hue
Than of *that* islet in the chestnut-bloom
Flamed in his cheek."
"We seem a kind of monster to you;
"We are used to *that*."

With regard to time, *that* refers either to past or future.

(*b*) *That* frequently refers to something which is familiar, or acknowledged or famous. Examples :—

"With *that* grace of hers,
Slow-moving as a wave against the wind."
"He spoke with *that* well-known eloquence of his."

(*c*) *That* followed by a prepositional or adjective phrase is used to refer back to something which has already been mentioned. Examples :—

"My work is easier than *that* of your brother."
"The proceedings of one parliament are upset by *that* coming after."

(*d*) *That* is very often used with a noun which is qualified by a relative clause. Example :—

"They gained *that* part of the ruins which commanded the most extensive outlook."

(*e*) *That* is rarely used for *such* or *so*. This usage is found in Shakespeare and in provincial dialects. Examples: —

> "From me whose love was of *that* dignity
> That it went hand in hand even with the vow
> I made to her in marriage."
> "He was *that* impertinent, that he was unbearable."
> "He showed *that* stupidity, that there was no explaining anything to him."

(*f*) The substantival use of *that* does not differ from the substantival use of *this*. We may, therefore, refer back to paragraphs (*c*) and (*d*) in our discussion of *this*, and from them no doubt the student will be able to frame examples for himself of the use of *that* as a substantive.

(*g*) As is the case with *this* and *these*, *that* and *those* are sometimes confused, on the grounds that we have already explained. We find expressions such as "*that* five pound," "*those* sort of things."

Opposition of *This* and *That*.

When *this* and *that* are opposed to one another, *this* refers to the nearer, *that* to the remoter, object. Example :—

> "What conscience dictates to be done,
> Or warns me not to do,
> *This* teach me more than hell to shun,
> *That* more than heaven pursue."

To put it in another way, *this* is equivalent to "the latter," *that* to "the former."

The opposition of *this* and *that* is often so slight that the words have no more force than *the one*, *the other*. Example :—

> "She changes with *this* mood or *that*."
> "She might have made *this* and *that* other world
> An other world for the sick man."

Sometimes, instead of the usual opposition of *this* and *that*, we find *this* opposed to *this*, *that* to *that*. Examples :—

> "*This* is white, *this* black."
> "*That* road is direct, *that* takes you miles out of your way."

This and *that* are sometimes repeated before each of several nouns when these nouns are not connected by "and" or any other conjunction. Example :—

> "*This* blessed spot, *this* realm, *this* England,
> *This* nurse, *this* teeming mother of royal kings."

3. *Yon*, *yonder*. These demonstrative pronouns refer to a remote object. They are very rarely used as substantives. The form *yon* is chiefly used in poetry; but *yonder* is met with in colloquial language and the language of prose. Examples :—

> "Blue is *yon* sky above us."
> "Come, let us sit on *yonder* bank."

4. *Such*. The old English form of this word was *swilc*; indeed, it is nothing more nor less than a compound of *swa* (so) and *lic* (like). The fact that it is compounded with *like* is so completely forgotten that we frequently find it used with *like*—*e.g.*, "such like bravery." This form of expression is not to be imitated; but still it frequently occurs even in good writers. *Such* is used (*a*) with substantives or with adjectives followed by substantives. Examples :—

> "Few attain to a position of *such* honour."
> "I have never before seen *such* unhappy men."

(*b*) It is used by itself, in reference to a noun which has gone before. Example :—

> "We have proclaimed you our king, and as *such* we honour you."

(*c*) The following sentences illustrate the use of *such* as a substantive :—

> "*Such* as they deserve no compassion."
> "*Such* as you cannot fail to succeed in the world."

(*d*) *Such* is very often followed by *a*. Example :—

> "On *such a* night
> Did pretty Jessica, like a little shrew,
> Slander her love, and he forgave it her."

(*e*) In Shakespeare and other old writers a curious use of *such*, followed by *which*, is to be observed. Example :—

> "There rooted between them *such* an affection, *which* cannot choose but branch now."

(*f*) *Such and such* is an idiomatic expression used to imply indefiniteness or uncertainty. Example :—

> "I will meet you at *such and such* an hour, at *such and such* a place."

Such is frequently followed by *as* with a noun or by *that* with a dependent clause. But very often it stands alone, and the comparison which it suggested must be gathered from the context.

On etymological grounds we may compare *thilk* and *ilk* with *such*, for these words are also derived from *lic* (like) with a prefix. *Thilk* means *the like, the same;* but it has gone out of use in the literary language of to-day, but it survives in some dialects under the form *thick* or *thicky*. You may have doubtless heard these words in the country.

Ilk means *same*. The expression "of that *ilk*' is still used in Scotland.

In his "Life of Dr. Johnson," Boswell tells us how he regretted that Dr. Johnson had left his chambers in Johnson's Court, because he could no longer be described as "Dr. Johnson of that *ilk*." The word *ilk* only survives in this expression. But in Chaucer's time *this ilk*, *that ilk* were constantly used in the sense of *this same*, *that same*. Example :—

> "This *ilk* worthe knight."

5. *Same*. This demonstrative is not used alone, but to strengthen *the*, *this*, *that*. It is sometimes

employed with substantives, sometimes absolutely. Examples:—

> "He came at *the same* time every morning."
> "*The same* to you."
> "That book is *the same* that I read yesterday."
> "I should be pleased to meet *this same* person again."

6. *So.* The use of *so* as a pronoun is rare. It is more commonly an adverb. In the following sentence it is a pronoun:—

> "Folly that both makes friends and keeps them *so*."

MUSIC.—X.

[*Continued from p.* 183.]

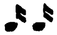
PULSE DIVISIONS.

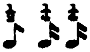
(STAFF NOTATION.)

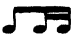
A half and two quarters—TAAtefe.

No new signs are required to show this division.

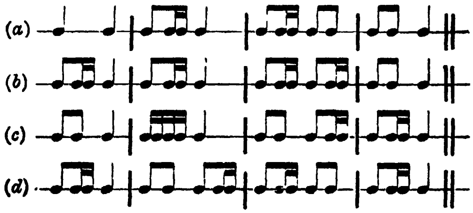
A quaver shows a half-pulse

Two semi-quavers show two quarter-pulses  or

The three notes together make up one pulse 

Sometimes written thus . . 

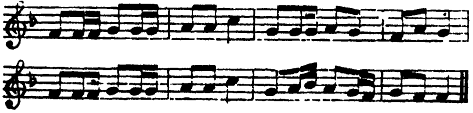
Ex. 83.—Sing to time names and to *laa.*



Each line should be sung separately several times before proceeding to the next. Finally the exercise should be sung straight through.

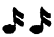
Ex. 84.

Doh is F (first space).

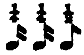
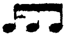


Two quarters and a half—tafaTAI.

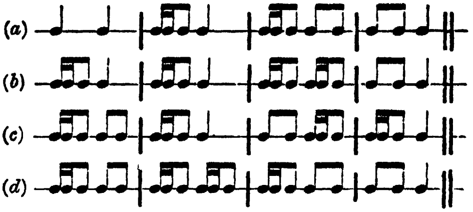
As with TAAtefe, no new signs are required.

Two semi-quavers show two quarters of a pulse  or

A quaver shows a half-pulse

The three notes together make up one pulse  or 

Ex. 85.—Sing to time names and to *laa.*

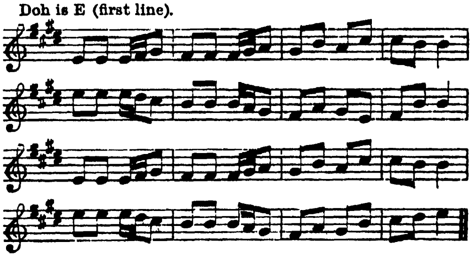


See directions to Ex. 83 above.

Ex. 86.

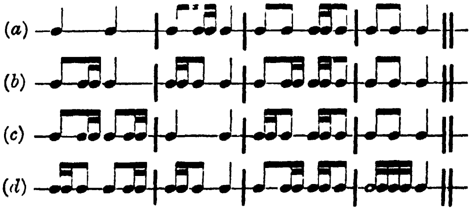
Melody by LECOCQ.

Doh is E (first line).



The following exercise combines both of the new divisions with others previously practised.

Ex. 87.—To be monotoned to time names, etc.



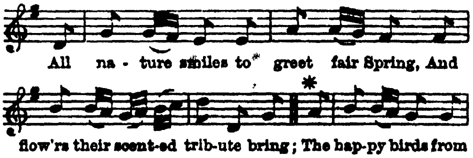
The round that follows combines in one piece all the duple divisions of a pulse that have been hitherto studied. It must be noted that each line commences and ends with a quaver. There must be no pause between the lines.

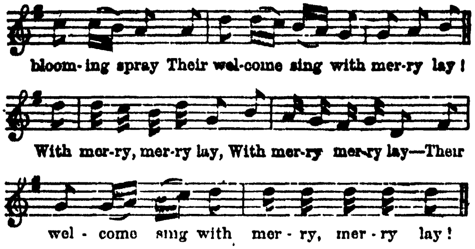
Ex. 88.—Round in three parts.

ALL NATURE SMILES.

ARNOLD.

Doh is G (second line).


All na - ture smiles to* greet fair Spring, And
flow'rs their scent-ed trib-ute bring; The hap-py birds from


bloom-ing spray Their wel-come sing with mer-ry lay!
With mer-ry, mer-ry lay, With mer-ry mer-ry lay—Their
wel - come sing with mer - ry, mer - ry lay!

The pulses in the above are at first difficult to see, because the notes are spread out to show the fitting of the words clearly. The curved line, it should be remembered, shows the notes that have to be *slurred* to one syllable of the words.

EAR-TRAINING.

The proper control of the voice is obviously primarily dependent upon the perceptions of the ear. To quicken and render exact the observation of the ear is therefore one of the most important objects of musical study. Hitherto in these lessons very little has been said respecting special ear exercises, because the course of study has been framed chiefly with a view to meet the case of learners studying without the skilled assistance almost indispensable for adequate ear-training. But if the time and tune exercises that have been given have been conquered, there are many ways in which even a solitary student can work to improve the observing powers of his ear. The power to be gained is that of immediately realising the names of tones played or sung *to* the listener—the power, in fact, of "*seeing with his ears.*" With fitful practice the ear remains dormant, and "ear-telling," consequently, is found by some students to be very difficult. The exertion of the ear to observe musical tones must be CONSTANT and HABITUAL.

An extremely valuable preparation for ear-training is the practice of

SINGING WITHOUT SOL-FAING.

"Telling by ear" involves the endeavour to recognise the scale positions of tones performed, not only without their names being uttered, but when they are, as it were, disguised by other syllables that distract the attention of the beginner. This being so, it will be seen that to sing exercises to *laa*, or to words, or to any syllables other than the sol-fa syllables, as recommended on p. 276, Vol. I., is a direct preparation for ear-telling, because in this way the ear becomes accustomed to listen for the various tonal effects without regarding the syllables that may be used in singing.

Another valuable aid to ear-training is the attentive

STUDY OF MENTAL EFFECTS.

Descriptions and illustrations of the mental effects of the tones of the scale occur again and again in the lessons that have been given. It will now be convenient for reference to collectively restate these descriptions. It should be clearly understood that these descriptions are put forth only as approximate, and as being consciously experienced only when a tone is sung slowly in association *with the other tones of the scale.*

MENTAL EFFECTS OF SCALE TONES.

(General.)		*(Special.)*
	RAY^{1}	Rousing, hopeful.
Strong, reposeful.	**DOH^{1}**	Firm, triumphant.
Leaning, very expectant.	**TE**	Piercing, keen, exciting.
Leaning, mildly expectant.	**LAH**	Sad, weeping.
Strong, reposeful.	**SOH**	Grand, bright, bold.
Leaning, very expectant.	**FAH**	Desolate, grave.
Reposeful.	**ME**	Tranquil, peaceful.
Leaning, expectant.	**RAY**	Prayerful.
Strong, reposeful.	**DOH**	Firm.
As above.	**TE$_{1}$**	Yearning.
	LAH$_{1}$	Pathetic.
	SOH$_{1}$	Majestic.
	FAH$_{1}$	Solemn.

The truth of these statements of effect must be learnt from actual experience and observation. It is quite useless to learn the foregoing table off by heart. Every exercise and every piece of music will in some way furnish illustrations. It must, however, be borne in mind that rapid rhythm and combinations of notes into chords produce innumerable and indescribable modifications of effect, and that for the present purpose only those effects observed when tones are heard in slow succession are meant to be studied (*see* Vol. I., p. 338). Special exercises are not called for here, because the tune exercises given will suffice. Let the student keep his ears on the look-out. To know what to look for or to expect is a great aid to observation.

A further study, that enables a pupil to strengthen his hold upon mental effect, and to closely bind syllable and effect in association, is the

SOL-FAING OF TUNES FROM MEMORY.

At first learn tunes that move slowly. Beware of mistakes creeping in that, by upsetting associations carefully built up by previous practice, will put you back: such, for instance, as singing the *names doh, ray, me,* to the *tones ray, me, fah,* and so on. Do *not* learn the names by *saying* them over as though you were learning prose or poetry. Always *sing* the tune and names together. When the tune and the names are welded together and are quite familiar, thoughtfully observe the mental effect of each tone as you sing it.

EAR-TRAINING EXERCISES.

These exercises apply to students of Tonic Sol-fa and Staff notation alike.

Ex. 89.—*Thinking musical tones.* Sing some of the former tune exercises through, and then try to re-hear them whilst looking at the copy.

Ex. 90.—Try to think the tune of an exercise not seen before, or one at least not too familiar.

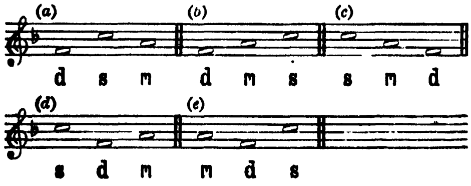
The following exercises are given for use when the student can obtain the assistance of a competent friend or teacher. They should be played on an instrument, or sung to *laa* or *aa*, the student, of course, not looking at the copy. Each lettered section of each exercise may be played over several times, according to the need of the listener, and each section may be utilised in the three following ways:—

1st. The listener to try to tell only the last tone of each set.

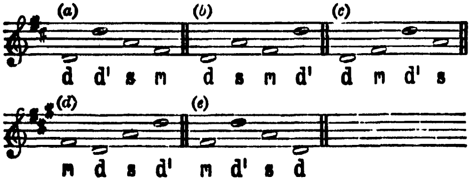
2nd. The listener to be told the first tone and to be required to name the others.

3rd. The listener to name all the tones of each set.

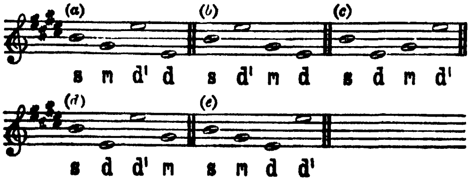
Ex. 91. Doh in 1st space=F.



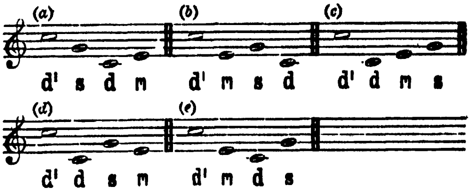
Ex. 92. Doh in space below=D.



Ex. 93. Doh on 1st line=E.



Ex. 94. Doh on 1st ledger line below=C.



In giving ear-exercises it is most important to change the key now and then, in order to prevent the listener from depending upon that strong, although fleeting, power of recollecting *absolute* pitch possessed in some degree by almost everyone. The problem is, What scale *relations* are presented in any given exercise?

Further exercises in ear-training will be given in future lessons.

The exercises that follow do not introduce fresh matter. They combine facts of time and tune already practised, and are intended to assist the student to gain fluency before a new step is attempted.

THIRD STEP EXERCISES (*continued*).

(TONIC SOL-FA NOTATION.)

Ex. 95.—Sing up the scale, striking some one tone *twice* in succession. Choose any pitch suitable to your voice.

d^1
t
l
s
f
m
r
d

(*a*) d r r m f s l t d^1
(*b*) d r m m f s l t d^1
(*c*) d r m f f s l t d^1
(*d*) d r m f s s l t d^1
(*e*) d r m f s l l t d^1
(*f*) d r m f s l t t d^1

Ex. 96.—Sing Ex. 95 backwards.

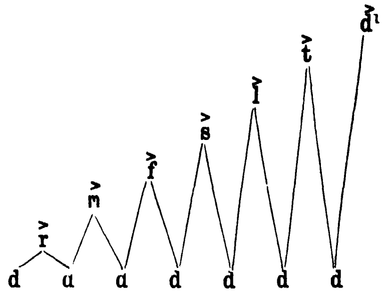
Ex. 97.—Sing up the scale, *omitting* one tone. Choose any pitch suitable to your voice.

(*a*) d r m f s l   d^1
(*b*) d r m f s   t d^1
(*c*) d r m f   l t d^1
(*d*) d r m   s l t d^1
(*e*) d r   f s l t d^1
(*f*) d   m f s l t d^1

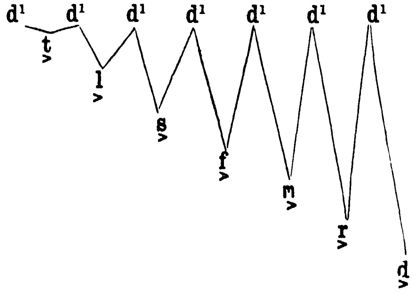
Ex. 98.—Sing Ex. 97 backwards.

Exs. 95 to 98 make good ear-telling exercises when sung or played *to* a student. In using them for this purpose they should be performed in irregular order.

Ex. 99.—Sing up the scale, making *doh* follow every tone in turn. The sign > means that a tone is to be emphasised strongly.



Ex. 100.—Sing down the scale, making *doh*^{1} follow every tone in turn.



Ex. 101.—Sing any scale tone after hearing or singing a *Doh* chord. The *Doh* chord to be repeated before each tone.

Doh chord. } Pause, and then the pupil sings {
d m s d^1 s m d

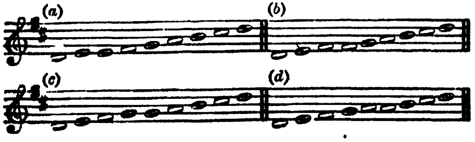
lah
ray
soh
te_1
fah
ray^1
me
te

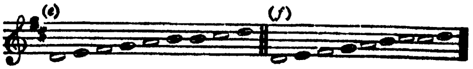
THIRD STEP EXERCISES (*continued*).

(STAFF NOTATION.)

Ex. 95.—Sing up the scale, striking some one tone twice in succession.

Doh is D (the space just below the staff).

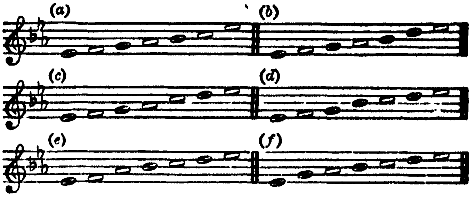




Ex. 96.—Sing Ex. 95 backwards.

Ex. 97.—Sing up the scale, omitting one tone.

Doh is E♭ (the lowest line).

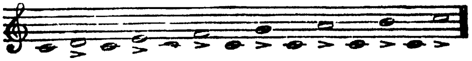


Ex. 98.—Sing Ex. 97 backwards.

Exs. 95 to 98 make good ear-telling exercises when sung or played *to* a student. In using them for this purpose they should be performed in irregular order.

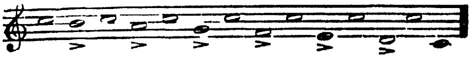
Ex. 99.—Sing up the scale, making *doh* follow every tone in turn. The sign > means that a tone is to be emphasised strongly.

Doh is C (the ledger line below the staff).



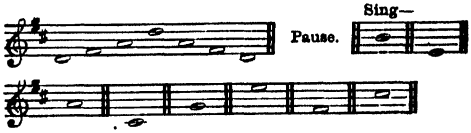
Ex. 100—Sing down the scale, making *doh*^{1} follow every tone in turn.

Doh is C.



Ex. 101.—Sing any scale tone after hearing or singing a *Doh* chord. The *Doh* chord to be repeated before each tone.

Doh is D (the space just below the staff).



DRAWING.—X.

[*Continued from p.* 137.]

FOLIAGE (*continued*).

IN our last lesson we mentioned that in drawing foliage the mode of treatment must in a very great measure be influenced by the *light and shade*, and we propose now, proceeding with this interesting part of our subject, to show what is meant by the term "*massing in the foliage*." There are some who think that it is necessary to have for each kind of tree some distinct and especial *touch*, classifying them as "the oak touch," "the elm touch," "the beech touch," and numerous others. They forget the fact that as the sun casts its light upon a tree it brings out the *shape and individual character* of its branches so definitely that even at a considerable distance, when it would be impossible to recognise the leaves, we can pronounce the tree to be an oak, or elm, or whatever else it may be, simply from the manner in which, as an artist would say, "the sun lights it up."

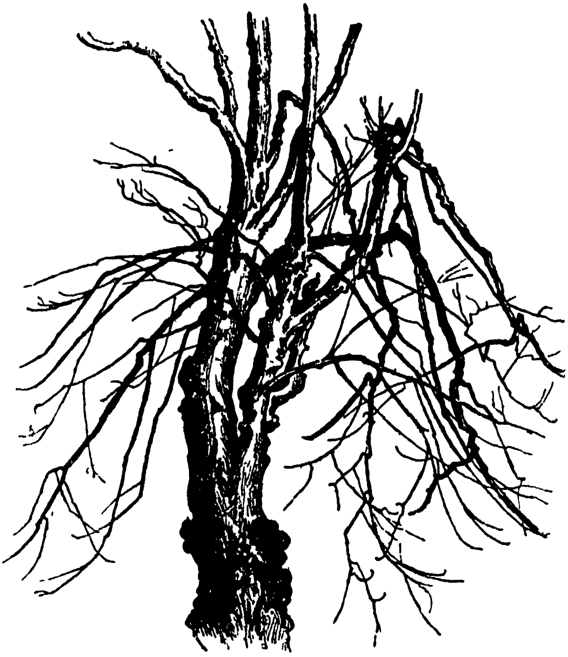


Fig. 100.

The most important consideration in drawing a tree is to devote much attention to the light, and the parts that are made out in light. There are two reasons why the lights are considered to have such special importance (this principle belongs not to trees only, but to every other object that claims the attention of the artist): the first is, because the details are more recognisable in the light than in the shade, and require particular care to represent them faithfully, for without the details in light there would be very little to show for our pains, as the shadows to a great extent absorb or obscure not only the colour but also the form; the other reason is, that the eye naturally rests upon the lights and all the brighter parts *first*—afterwards, when we make a further and closer examination, we see the parts in shadow. Nor must we enter into laborious and painful detail, as in the practice of mere leaf-painting. As we have said before, we do not look at leaves *singly*, but at foliage —leaves *collectively*; therefore those branches of a tree, let its kind be what it may, which are in the light will have their own especial forms in mass to characterise them, and it is those forms in masses which we must copy. But lest our pupil should suppose from these remarks upon generalising foliage that we intend him to stop here, and to represent nothing more than the breadth of light and shade, we must remind him of what has been said above respecting the details in light; we must remember also that, however broadly and definitely the light may fall upon a tree, since it is not a flat surface like a wall there will be hundreds of minor shadows and semi-tones scattered all over the extent of light, and there is as much individuality amongst these as in the whole mass, and their characteristics in detail are not less striking and significant because they are small; in short they are reduced repetitions of the general masses of light, and must be treated with the same feeling if we wish to make a faithful representation.

Sir Joshua Reynolds mentions a landscape painter who was remarkable for his patience in what he considered "high finish," and thought that the greatest excellence to be attained consisted in the representation of every leaf on a tree. "This picture," says Sir Joshua, "I never saw, but I am very sure that an artist who regards only the general character of the species, the order of the branches, and the masses of the foliage, will in a few minutes produce a more true resemblance of trees than this painter in as many months." We must dwell for a few moments upon the principles here inculcated, and explain by what means a painter obtains the enviable power of making a faithful resemblance with comparatively slight labour. It is because he adopts the excellent practice of making separate studies of details, such as branches, trunks, stems, weeds, and foregrounds—in short, everything that may be deemed worthy of note. It is this method of copying parts of objects with close accuracy that gives him the power of representing them generally and yet faithfully, with the natural effect which they bear to one another as a whole. An eminent English landscape painter, whose manner was as remarkable for its freedom of execution as it was for the truthfulness of its results, once remarked to us, "The secret of my success is in having bestowed much time upon the close examination of the *anatomy* of trees: how their branches spring from their trunks; the forms of their leaves, and the manner in which they grow or cluster in masses from the stems." When such labour and painstaking as this is the rule, we need not wonder at a successful result.

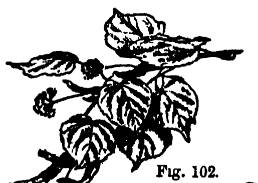


Fig. 102.

Fig. 101.

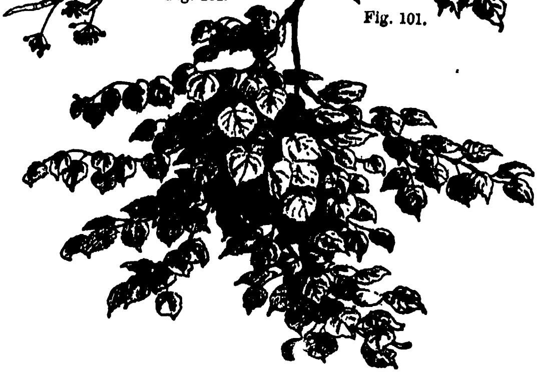


Fig. 103

Having said this much upon the theoretical part of our subject, we will now turn to the practical. We advise the pupil to make a drawing of Fig. 101, *leaves of the lime tree*, with an H B pencil. He must *first* make the arrangement of the whole of the stems, and then proceed with the leaves, beginning where the two stems join, arranging every leaf in succession, without passing over any, to the end, then *faint* the arrangement, and draw carefully every particular: it will be much better at first to make an enlarged drawing, two or three times the size of the copy; do the same also with Fig. 102. Fig. 103 will require more time and attention, which must be especially bestowed on the lights and shadows. The pupil will observe the leaves upon the dark mass in the centre of the branch; and here we will particularly advise him *not to begin the shading until the outline is completed*, adding, that this should be a *rule* under *all* circumstances; therefore, after the outline has been carefully made, he must *tone down*—that is, draw even and close lines over the part in shade up to the outline of the leaves, and further, to make the tint even, he may cross the lines with others similar to the flat tint (Fig. 82, lesson VIII, p. 75.) He must be careful to go up to the edges of the leaves, as they will come out very forcibly against the dark ground; an H B pencil will make this tint sufficiently dark, as all blackness must be avoided. Here again we must introduce another caution respecting the treatment of shadows amongst foliage—namely, never make the interior shadows too dark; a moderate, clear, and yet decisive tone will be enough, because there must be in all cases, but especially with regard to trees, sufficient opportunities left for marking in more forcibly any form which may be remarked in the shadows, observing that the making out details in shadows cannot be carried to the extent of making out details in the lights. Trees, as we have previously said, are not flat like walls, but their branches and leaves project and recede indefinitely, and consequently those leaves which come out nearer to the light will require a different tone from those which are in shadow; the pupil's own observation must be his guide in this matter as to which leaves must receive the minor tones and the depth of tint to be laid upon them. In Fig. 103 the light falls upon the right side, where less shading is required, but the whole of the leaves to the left, away from the light, must be toned down, though not to the extent of the deep shadow in the middle and interior of the branch. Fig. 100 we recommend should be copied double the size, and according to our old principle of *marking in*. We were once asked by a pupil, "When shall I leave off marking in?" We replied, *never;* it is not desirable that you should ever leave off the practice, because all who do mark in find that they make progress in drawing, and that it saves time, and produces a more satisfactory result. A young mechanic whom we know, who had very much improved his power of drawing from attending a night class at a Mechanics' Institute, offered himself as a candidate for a situation as draughtsman at a manufactory where drawing was essential. Having obtained it, one of his employers, after a few days, when he had become familiar with his work, brought him three or four subjects to draw for working purposes, telling him at the same time that they would, no doubt, occupy him four days at least. At the same hour on the following day he returned the whole finished. His master was agreeably surprised, and also much pleased with the excellence of the work, and asked him how he had done it so well and so quickly. He replied —"I am very particular in *arranging* my drawing first, and always *make marks to indicate the course of the outline;* the consequence is I have very little rubbing out and alteration, and that has enabled me to finish the drawing so quickly." Therefore in copying Fig. 100 note every angle, and the distances between each angle, and the same respecting the positions of the branches as they grow from the trunk, the direction and inclination of the branches, and their extent, and you cannot fail to make a satisfactory drawing.

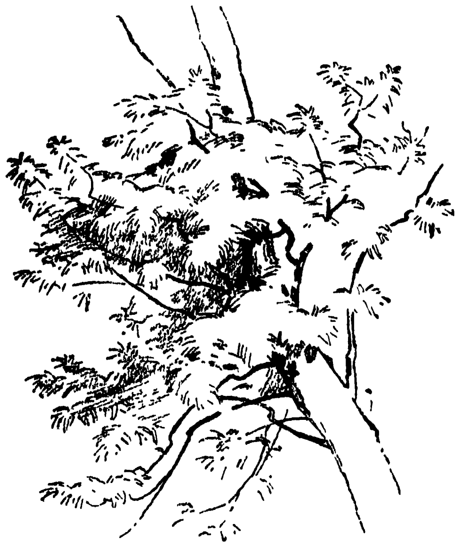


Fig 104.

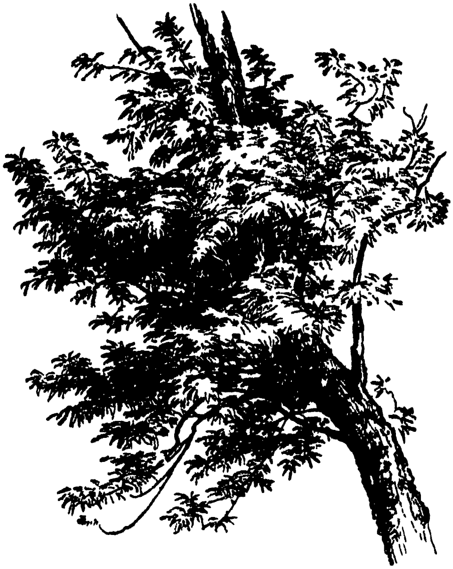


Fig 105.

Figs. 101, 102, 103, are representations of the branches, blossom, and leaves of the *Tilia Europæa,* the European or common lime, which is the most valuable of the different varieties of this useful tree. It grows most extensively in the middle and northern parts of Europe, and is very common in England. Its large size, handsome appearance, and profusion of sweet flowers and their pleasant perfume, make it a very general favourite throughout this country and most parts of the Continent, where it is extensively planted in parks and other places of public recreation. Its wood is well adapted for carving, being white, close-grained, and smooth. The carvings at Windsor Castle, those of Trinity College, Cambridge, and those at Chatsworth are of limewood, as, indeed, are many other fine specimens of this branch of art in England. The fibres of the bark, which is tough, form the material of an extensive manufacture of cordage and matting in Russia and Sweden. Many specimens of this tree exist which are remarkable for their great age and size. At Neustadt, in Würtemberg, there is a prodigious lime tree, which adds its name to that of the town, this being called *Neustadt an der Linden* (Neustadt at the lime tree). The age of this enormous tree is said, probably with some exaggeration, to be one thousand years.

The illustrations given in Figs. 104, 105, 106, and 107 will form a useful lesson in the manner of treating foliage in masses. First the outline of the trunk must be indicated, then the branches growing from it, and next the forms taken by the foliage on the branches. It is most important to observe this sequence; and as it is arranged on a common-sense principle it will not be hard to remember. The trunk and branches, being the framework of the tree, must be drawn first, as upon them the character of the general outline depends; and then naturally follow the masses of foliage, again dependent for their outline upon the branches which support them. When this is done the shading may be commenced, great attention being paid to the preservation of the lights and the management of the half-tones, as it is these latter which give rotundity and depth to the whole. We would advise our pupils to make both these drawings on a considerably larger scale than space permits us to give them in our illustrations. In this way greater freedom and breadth of style will be obtained, the smaller details being more easily made out, and the distinction of treatment in the two kinds of foliage will be more clearly defined.

We have frequently noticed beginners, in their first attempts to draw trees, start off with that which they call "the shading," regardless of the fact that trees have trunks and stems upon which the foliage depends, and equally so as to the importance of the lights, which vary as much as the trees themselves; these lights must be so managed that *all the half-tints and darker parts must be made subservient to them.* A proper acquaintance with the growth of the stems will assist us in understanding the disposition of the lights, as by them we must give the individual character of the tree; in other words, the lights, as they fall upon the foliage, are in their extent governed by that upon which the foliage depends—that is, the stems. We shall return to this again; in the meantime we will place before the pupil an example which practically has more to do with detail than with the broader manner we shall enter upon in the next lesson. Our object in this arrangement is with a view of showing him the necessity of making himself capable, by this additional example, of entering into details, previous to the practice of the general distribution of light and shade, which, it will be our endeavour to show, must afterwards receive those characteristic details which belong to trees in particular. Fig. 107 is the finished drawing of a fir-tree, whilst Fig. 106 represents the method we recommend in copying it. The sharp angular manner of execution will be noticed in contradistinction to the horizontal and broader method of the oak, or the drooping and almost perpendicular style of the willow. These should be copied on a larger scale, as a broader and more effective drawing will be obtained thereby than if it be done on too diminutive a scale; and, besides, the details will be better understood, and there will be also greater opportunity for entering fully into all minor particulars, which, if carefully observed, without descending to littleness of manner, will have so much influence upon the whole.

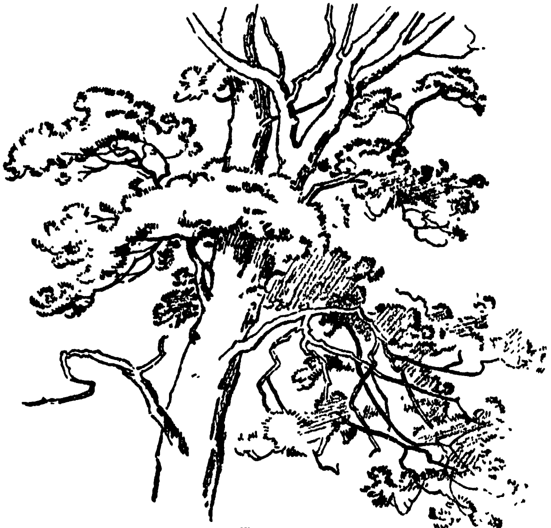


Fig. 106.

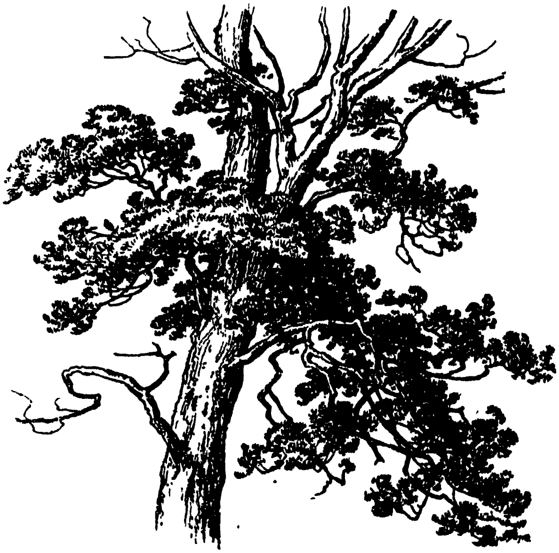


Fig. 107.

As there is in many respects a close affinity between foregrounds and trees, it might be advisable at this stage to enter somewhat upon the treatment of foregrounds, preparatory to the remaining instructions we propose to give upon trees. Shrubberies, scattered bushes overgrown with brambles and honeysuckle, very properly belong to foregrounds; their mixed character, being neither trees nor plants, claim most of the remarks we shall have to make upon both. For studies for foregrounds, Nature will be our greatest help and resource, affording at all times an endless variety of subjects, which can be more conveniently obtained than the larger specimens of vegetation. It is an excellent practice, and one that is very common amongst artists, to collect specimens of wild plants and preserve them in water; or, what is better when practicable, take them up bodily with the roots and plant them in pots. From these, separate and careful studies may be made, which will prove to be an excellent preparation for more extensive practice when drawing them collectively in their natural state, as seen on the common, under the hedges, or in shady lanes. In the practice of drawing foreground herbage, a writer on art observes "that the edges of the several more advancing leaves must be made sharp and decisive against the ground, whilst those that retire may have less opposition; this will assist their perspective," and they will acquire a more receding character by slightly toning down or blending the remoter parts with the ground or objects behind them; this rule may be applied to all objects, regardless of their size or form. The strength of the shadows must be allowed to be an important consideration. Our pupils will remember the observation, that near the highest lights are the darkest shadows; so, for example, should the light fall strongly upon the leaves of a plant, the shadows beneath them will bear the same proportion of depth, and those leaves which receive less light will have less strength in their shadows.

Whilst we recommend our pupils to make close copies of plants separately, in order to obtain a knowledge of their construction and character, we are not advising them to make botanical studies, but *art* studies; this procedure will be all that is necessary to obtain a practical acquaintance with their forms, and will enable our students to represent them with greater skill and freedom, which is of such great importance when grouping plants in a landscape. The work then will be in the end pleasing and satisfactory, because it is truthful; otherwise, when less attention is paid to particular details, and a slovenly manner is employed, it is sure to terminate in confusion and failure.

Burnet, in his work on Landscape Painting, says, "To begin with, the foreground, as being that part of the landscape nearest the eye, it is necessary, therefore, that it should receive all those qualities conducive to its situation—such as detail, breadth, and largeness of parts." In contrast to this the same writer says:—"In the early stages of the art, the minutiæ of individual plants and flowers were carried to the highest pitch of absurdity; not only is the whole ground of these pictures inlaid with endless specimens of botanic scrupulosity, but the intervening spaces are filled with reptiles and insects, as if the lives of the artists had been of an antediluvian length."

FRENCH.—X.

[*Continued from p.* 142.]

PRESENT INDICATIVE OF THE IRREGULAR VERBS.

APPRENDRE, *to learn.*	CONNAÎTRE, *to know.*	SAVOIR, *to know.*
J'apprends, *I learn, do learn,* or *am learning.*	Je connais, *I know, do know,* or *am knowing.*	Je sais, *I know, do know,* or *am knowing.*
Tu apprends.	Tu connais.	Tu sais.
Il apprend.	Il connaît.	Il sait
Nous apprenons.	Nous connaissons.	Nous savons.
Vous apprenez.	Vous connaissez.	Vous savez.
Ils apprennent.	Ils connaissent.	Ils savent.

Connaître means *to be acquainted with;* **savoir,** *to have knowledge of, to be versed in:—*

Connaissez-vous ce Français, cet Anglais, cet Allemand, et cet Espagnol?	*Do you know that Frenchman. that Englishman, that German, and that Spaniard?*
Savez-vous le français, l'anglais, l'allemand, et l'espagnol?	*Do you know French, English, German, and Spanish.*

MISCELLANEOUS EXAMPLES.

Le capitaine G. sait-il le français?	*Does Captain G. know French?*
Il ne le sait pas, mais il l'apprend.	*He does not know it, but is learning it.*
Connaissez-vous le Docteur L.?	*Do you know Dr. L.?*
Je ne le connais pas, mais je sais où il demeure.	*I am not acquainted with him, but I know where he lives.*
Ce monsieur est-il peintre?	*Is that gentleman a painter?*
Non, il est architecte.	*No, he is an architect.*
Ce monsieur est un architecte distingué.	*That gentleman is a distinguished architect.*
Ce Français parle grec et arabe.	*That Frenchman speaks Greek and Arabic.*
Il parle grec, arabe, et italien.	*He speaks the Greek, Arabic, and Italian languages.*
Avez-vous vu Charles dix, frère de Louis dix-huit?	*Have you seen Charles the Tenth, a brother of Louis the Eighteenth?*

VOCABULARY.

Allemand, -e, *German.*
Ancien, -ne, *ancient.*
Anglais, -e, *English.*
Chinois, -e, *Chinese.*
Danois, -e, *Danish. Dane.*
Grec, -que, *Greek.*
Hongrois, -e, *Hungarian.*
Langue, f. *language.*
Moderne, *modern.*
Polonais, -e, *Polish, Pole.*
Russe, *Russian.*
Suedois, -e, *Swedish, Swede.*
Tapissier, m. *upholsterer.*

EXERCISE 63.

Translate into English:—

1. Aimez-vous le pain ou la viande? 2. Allez-vous tous les jours dans le bois de Monsieur le capitaine? 3. Monsieur le président est-il chez lui? 4. Connaissez-vous ce Monsieur? 5. Oui, Madame, je le connais fort bien. 6. Savez-vous de quel pays il est? 7. Il est hongrois. 8. Parle-t-il allemand? 9. Il parle allemand, polonais, russe, suédois, et danois. 10. N'est-il pas médecin? 11. Avez-vous

envie d'apprendre le russe? 12. J'ai envie d'apprendre le russe et le grec moderne. 13. Connaissez-vous les messieurs qui parlent à votre sœur? 14. Je ne les connais pas. 15. Savez-vous où ils demeurent? 16. Je ne le sais pas. 17. N'avez-vous pas l'histoire de Louis quatorze dans votre bibliothèque? 18. Vos compagnons apprennent-ils les langues anciennes? 19. Ils savent plusieurs langues anciennes et modernes. 20. Parlez-vous anglais? 21. Je sais l'anglais et je le parle. 22. Connaissez-vous l'Anglais que nous voyons? 23. Je ne le connais pas.

EXERCISE 64.

Translate into French:—

1. Does our physician know French? 2. He knows French, English, and German. 3. Do you know the French physician? 4. I know him very well. 5. Are you acquainted with that lady? 6. I am not acquainted with her. 7. Is she a German or a Swede? 8. She is neither a German nor a Swede, she is a Russian. 9. Do you intend to speak to her? 10. I intend to speak to her in (*en*) English. 11. Does she know English? 12. She knows several languages; she speaks English, Danish, Swedish, and Hungarian. 13. Is your brother a colonel? 14. No, he is a captain. 15. Are you a Frenchman? 16. No. I am an Hungarian. 17. Do you know Chinese? 18. No, I do not know Chinese. 19. Do you know the Englishman who lives at your brother's? 20. I am acquainted with him. 21. Do you like books? 22. I am fond of books. 23. Have you a desire to learn Russian? 24. I have no desire to learn Russian. 25. Have you no time? 26. I have but little time.

RELATIVE PRONOUNS.

Qui, used as a nominative, and having an antecedent, may relate to persons or to things:—

Les fleurs qui sont dans votre jardin.	*The flowers which are in your garden.*

Qui, having an antecedent, is used as an indirect object, *i.e.*, with a preposition, but *only in reference to persons*:—

Je connais le monsieur à qui vous venez de parler.	*I know the gentleman to whom you have just spoken.*

Without an antecedent *qui* is used *only in reference to persons*, as subject and as object, with and without preposition:—

Qui est là?	*Who is there?*
Nous ne savons qui est arrivé.	*We do not know who has arrived.*
Je sais de qui vous parlez.	*I know of whom you are speaking.*
Je consulterai qui je voudrai.	*I shall consult whom I like.*
Qui votre frère voit-il?	*Whom does your brother see?*
De qui parlez-vous ce matin?	*Of whom do you speak this morning?*

Que may be said of persons or things. It can never be understood, and must be repeated before every verb:—

Les personnes que nous voyons.	*The persons whom we see.*
Les langues que nous apprenons.	*The languages which we learn.*

Ce qui, *ce que* are employed for *that which*, or its equivalent *what*:—

Ce qui est vrai est beau.	*What is true is beautiful.*
Ce que vous apprenez est utile.	*That which you learn is useful.*
Trouvez-vous ce que vous cherchez?	*Do you find what you seek?*

Que answers to the English pronoun *what* used absolutely before a verb:—

Que pensez-vous de cela?	*What do you think of that?*

Quoi is generally preceded or followed by a preposition, and relates only to things:—

De quoi voulez-vous parler?	*Of what do you wish to speak?*
A quoi pensez-vous?	*Of what do you think?*
Quoi de plus aimable que la vertu?	*What is more amiable than virtue?*

Lequel, m., *laquelle*, f., *lesquels*, m.p., *lesquelles*, f.p., *which*, or *which one*, or *which ones*, relate to persons or things. They may be preceded by a preposition:—

Lequel avez-vous apporté?	*Which one have you brought?*
Duquel parlez-vous?	*Of which one do you speak?*

Dont, meaning *of which* or *of whom*, *whose*, may relate to persons or things, in the masculine or feminine, singular or plural. It can never be used absolutely, and must always be preceded by an antecedent:—

Les fleurs dont vous me parlez.	*The flowers of which you speak to me*
Les demoiselles dont votre sœur vous parle.	*The young ladies of whom your sister speaks to you.*

PRESENT INDICATIVE OF THE IRREGULAR VERBS.

DIRE, *to say.*	FAIRE, *to make, to do.*	METTRE, *to put.*
Je dis, *I say, do say, or am saying.*	Je fais, *I make or do, I am making or doing.*	Je mets, *I put, do put, or am putting.*
Tu dis.	Tu fais.	Tu mets.
Il dit.	Il fait.	Il met.
Nous disons.	Nous faisons.	Nous mettons.
Vous dites	Vous faites.	Vous mettez.
Ils disent.	Ils font.	Ils mettent.

MISCELLANEOUS EXAMPLES.

Connaissez-vous le monsieur qui parle à notre cousin?	*Do you know the gentleman who speaks to our cousin?*
Je connais celui qui lui parle.	*I know the one who speaks to him.*
Comprenez-vous ce que je vous dis?	*Do you understand what I say to you?*
Qui vous a parlé de cette affaire?	*Who has spoken to you of this affair?*
L'Anglais dont vous parlez est ici.	*The Englishman of whom you speak is here.*
L'Espagnol dont la sœur est ici.	*The Spaniard whose sister is here.*
Que faites-vous ce matin?	*What do you do this morning?*
Que dites-vous à notre ami?	*What do you say to our friend?*
Nous faisons ce que vous nous dites.	*We do that which you say to us.*

Pour qui faites-vous cet habit?	*For whom do you make this coat?*
De quoi parlez-vous à votre frère?	*Of what do you speak to your brother?*
Nous faisons ce que nous pouvons.	*We do what we can.*
Nous parlons de ce dont vous parlez.	*We speak of that of which you speak.*

VOCABULARY.

Arriv-er, 1, *to arrive.*
Coffre, m. *trunk.*
Command-er, 1, *to order.*
Enfant, m. *child.*
Habillement, m. *dress, clothes.*
Linge, m. *linen.*
Nom, m. *name.*
Plaisir, m. *pleasure.*
Presque, *almost.*
Recommand-er, 1, *to recommend, enjoin.*
Rien, *nothing.*
Vrai, -e, *true.*

EXERCISE 65.

Translate into English:—

1. Qui connaissez-vous? 2. Nous connaissons les Hollandais dont vous nous parlez. 3. Quelle leçons apprenez-vous? 4. Nous apprenons les leçons que vous nous recommandez. 5. Ce qu'il vous dit est-il vrai? 6. Ce que vous nous dites est vrai. 7. De qui nous parlez-vous? 8. Nous vous parlons des Ecossais qui viennent d'arriver. 9. Savez-vous qui vient d'arriver? 10. Je sais que le monsieur que votre frère connait vient d'arriver. 11. Que font vos sœurs? 12. Elles ne font presque rien; elles n'ont presque rien à faire. 13. Que mettez-vous dans votre coffre? 14. Nous y mettons ce que nous avons, nos habillements et notre linge. 15. N'y mettez-vous pas vos souliers? 16. Nous y mettons les souliers dont nous avons besoin. 17. De quoi avez-vous besoin? 18. Nous avons besoin de ce que nous avons. 19. Cet enfant sait-il ce qu'il fait? 20. Il sait ce qu'il fait et ce qu'il dit. 21. Ne voulez-vous pas le leur dire? 22. Avec beaucoup de plaisir. 23. Faites-vous ce que le marchand vous commande? 24. Nous faisons ce qu'il nous dit. 25. Il parle de ce dont vous parlez.

EXERCISE 66.

Translate into French:—

1. Have you what (*ce dont*) you want? 2. We have what we want. 3. Is the gentleman whom you know here? 4. The lady of whom you speak is here. 5. Is she just arrived? 6. She is just arrived. 7. Do you know that gentleman? 8. I know the gentleman who is speaking with your father. 9. Do you know his name? 10. I do not know his name, but I know where he lives. 11. What do you do every morning? 12. We do almost nothing; we have very little to do. 13. Does this tailor make your clothes? 14. He makes my clothes, my brother's, and my cousin's. 15. Do you know the Scotchman of whom your brother speaks? 16. I know him well. 17. Is that which you say true? 18. What I say is true. 19. Do you understand that which I say to you? 20. I understand all that you say. 21. Of whom does your brother speak? 22. He speaks of the gentleman whose sister is here. 23. Is your brother wrong to do what he does? 24. He cannot be wrong to do it. 25. Where do you put my books? 26. Into (*dans*) your brother's trunk.

IDIOMATIC USE OF *METTRE, FAIRE*, &c.

The verb *mettre* is used in the same sense as in the English *to put on*, in speaking of garments. *Mettre le couvert* means *to lay the cloth* or *set the table*:—

Quel chapeau mettez-vous?	*What hat do you put on?*
Votre frère met son habit noir.	*Your brother puts on his black coat.*
Le domestique va mettre le couvert.	*The servant is going to lay the cloth.*

Ôter means *to take off, to take away, to take out*:—

Mon domestique ôte son chapeau.	*My servant takes off his hat.*
Ôtez ce livre de la table.	*Take away that book from the table.*
N'a-t-on pas ôté dîner?	*Have they not taken away the dinner?*

The verb *faire* is used before another verb in the sense of *to have, to cause*:—

Votre frère fait-il bâtir une maison?	*Does your brother have a house built?*
Il en fait bâtir plus d'une.	*He has more than one built.*

It may be used in the same sense before its own infinitive:—

Je fais faire un habit de drap.	*I have a cloth coat being made.*
Vous faites faire des souliers de cuir.	*You are having leather shoes made.*

Vouloir followed by *dire* is used in the sense of *to mean*:—

Que voulez-vous dire?	*What do you mean?*
Que veut dire votre sœur?	*What does your sister mean?*

MISCELLANEOUS EXAMPLES.

Ne mettez-vous pas vos habits?	*Do you not put on your clothes?*
J'ai peur de les gâter.	*I am afraid of spoiling them.*
Ne portez-vous jamais votre habit noir?	*Do you never wear your black coat?*
Je le mets tous les samedis.	*I put it on every Saturday.*
Pourquoi n'ôtez-vous pas votre manteau?	*Why do you not take off your cloak?*
J'ai trop froid, j'ai peur de l'ôter.	*I am too cold, I am afraid to take it off.*
Faites-vous raccommoder vos souliers?	*Do you have your shoes mended?*
Je fais raccommoder mes habits.	*I have my clothes mended.*
Je fais faire une paire de bottes.	*I have a pair of boots made.*
Je fais creuser un puits.	*I have a well dug.*
Que veut dire votre frère?	*What does your brother mean?*
Que veut dire cela?	*What does that mean?*
Cela ne veut rien dire.	*That means nothing.*
Ôtez-vous vos souliers et vos bas?	*Do you take off your shoes and stockings?*
Je n'ôte ni les uns ni les autres.	*I take off neither these nor those.*
Le dîner est prêt; le domestique va mettre le couvert.	*Dinner is ready; the servant is going to lay the cloth.*
Voulez-vous ôter le couvert?	*Will you take away the things from the table?*
Je vais mettre le couvert.	*I am going to lay the cloth.*
Je vais ôter le couvert.	*I am going to take away the things.*

VOCABULARY.

Apothicaire, m. *druggist.*
Cave, f. *cellar.*
Creus-er, 1, *to dig.*
Dîner, m. *dinner.*
Fâché, -e, *sorry, angry.*
Gât-er, 1, *to spoil.*
Gilet, m. *waistcoat.*
Grand, -e, *large.*
Manteau, m. *cloak.*
Noir, -e, *black.*
Pantoufle, f. *slipper.*
Pourquoi, *why.*
Prêt, -e, *ready.*
Raccommod-er, 1, *to mend.*
Tout à l'heure, *immediately.*
Uniforme, m. *uniform.*

EXERCISE 67.

Translate into English :—

1. Le général N. met-il son uniforme ? 2. Il ne le met point. 3. Pourquoi ne portez-vous point votre manteau noir ? 4. J'ai peur de le gâter ? 5. Mettez-vous vos souliers de satin tous les matins ? 6. Je ne les mets que les dimanches. 7. Il est midi ; le domestique met-il le couvert ? 8. Il ne le met pas encore ; il va le mettre tout à l'heure. 9. Le dîner n'est-il pas prêt ? 10. Le domestique ôte-t-il le couvert ? 11. Il ne l'ôte pas encore, il n'a pas le temps de l'ôter. 12. Ôtez-vous votre habit quand vous avez chaud ? 13. Je l'ôte quand j'ai trop chaud. 14. Faites-vous faire un habit de drap ? 15. Je fais faire un habit de drap et un gilet de satin noir. 16. Ne faites-vous point raccommoder vos pantoufles de velours ? 17. Ne faites-vous pas creuser une cave ? 18. Je fais creuser une grand cave. 19. Que veut dire l'apothicaire ? 20. Il veut dire qu'il a besoin d'argent. 21. Savez-vous ce que cela veut dire ? 22. Cela veut dire que votre frère est fâché contre vous. 23. Avez-vous envie de mettre votre manteau ? 24. J'ai l'intention de le mettre, car j'ai grand froid. 25. Je vais l'ôter car j'ai chaud.

EXERCISE 68.

Translate into French :—

1. Do you take off your coat ? 2. I do not take off my coat, I put it on ? 3. Do you take off your cloak when you are cold ? 4. When I am cold I put it on. 5. Does your little boy take off his shoes and stockings ? 6. He takes them off, but he is going to put them on again (*remettre*). 7. Does that little girl lay the cloth ? 8. She lays the cloth every day at noon. 9. Does she take away the things after dinner ? 10. She takes away the things every day. 11. Do you intend to have a coat made ? 12. I intend to have a coat made. 13. I am going to have a coat and a waistcoat made. 14. Does your brother have his boots mended ? 15. He has them mended. 16. What does your son mean ? 17. I do not know what he means. 18. Is he angry with me or with my brother ? 19. He is neither angry with you nor with your brother. 20. Is he afraid to spoil his coat ? 21. He is not afraid to spoil it. 22. Does the druggist want money ? 23. He does not want money ? 24. Has your sister taken my book from the table ? 25. She has not taken it away. 26. Why do you take off your shoes ? 27. I take them off because they hurt me (*me font mal*).

IMPERSONAL VERBS.

The impersonal verb is conjugated only in the third person singular. The nominative neuter pronoun, il, *it*, is used absolutely with the impersonal verb, *i.e.*, it represents no noun previously expressed :—

Il pleut aujourd'hui.	*It rains to-day.*

The impersonal verb assumes the termination of the class or conjugation to which it belongs. Some verbs are always impersonal ; others are only occasionally so.

PRESENT INDICATIVE OF THE IMPERSONAL VERBS.

Y AVOIR, *to be there.*	PLEUVOIR, *to rain.*	NEIGER, *to snow.*
Il y a, *there is, there are.*	Il pleut, *it rains, it is raining.*	Il neige, *it snows, it is snowing.*
GRÊLER, *to hail.*	GELER, *to freeze.*	DÉGELER, *to thaw.*
Il grêle, *it hails, it is hailing.*	Il gèle, *it freezes, it is freezing.*	Il dégèle, *it thaws, it is thawing.*

Il y a means *there is*, or *there are*, and may be followed by a singular or by a plural noun :—

Il y a du gibier au marché.	*There is game in the market.*
Il y a des pommes dans votre jardin.	*There are apples in your garden.*

In relation to the weather, the verb *faire* is used impersonally in the same manner as the English verb *to be.*

Il fait beau temps aujourd'hui.	*It is fine weather to-day.*
Il fait chaud, il fait froid.	*It is warm, it is cold.*

MISCELLANEOUS EXAMPLES.

Pleut-il ce matin ?	*Does it rain this morning ?*
Il ne pleut pas, il neige.	*It does not rain, it snows.*
Il va pleuvoir ce matin.	*It is going to rain this morning.*
Ne gèle-t-il pas ce matin ?	*Does it not freeze this morning ?*
Il ne gèle pas, il fait du brouillard.	*It does not freeze, it is foggy.*
Y a-t-il plusieurs personnes chez moi ?	*Are there several persons at my house ?*
N'y a-t-il personne à l'eglise ?	*Is there nobody at church ?*
Fait-il froid ou chaud aujourd'hui ?	*Is it cold or warm to-day ?*
Il fait chaud et humide.	*It is warm and damp.*
Fait-il du vent ou du brouillard ?	*Is it windy or foggy ?*

VOCABULARY.

Assemblée, f. *assembly, party.*
À verse, *in torrents.*
Bibliothèque, f. *library.*
Brouillard, m. *fog.*
Chambre, f. *room.*
Cinquante, *fifty.*
Couvert, -e, *cloudy.*
Épais, -se, *thick.*
Gibier, m. *game.*
Humide, *damp.*
Manuscrit, m. *manuscript.*
Souvent, *often.*
Veau, m. *veal.*
Vent, m. *wind.*
Volaille, f. *poultry.*

EXERCISE 69.

Translate into English :—

1. Quel temps fait-il aujourd'hui ? 2. Il fait un temps superbe. 3. Fait-il très beau temps aujourd'hui ? 4. Il fait un temps couvert et humide. 5. Pleut-il beaucoup ce matin ? 6. Il ne pleut pas

encore, mais il va pleuvoir. 7. Fait-il du vent ou du brouillard? 8. Il ne fait pas de vent. 9. Le brouillard est très épais. 10. Combien de personnes y a-t-il à l'assemblée? 11. Il y a plus de deux cents personnes. 12. N'y a-t-il pas beaucoup de manuscrits dans votre bibliothèque? 13. Il n'y en a pas beaucoup, il n'y en a que cinquante-cinq. 14. Fait-il trop froid pour vous dans cette chambre? 15. Il n'y fait ni trop froid ni trop chaud. 16. Y a-t-il beaucoup de foin dans votre écurie? 17. Il y en a assez pour mon cheval. 18. Restez-vous à la maison quand il pleut? 19. Quand il pleut je reste à la maison, mais quand il fait beau temps je vais chez mon cousin. 20. Y a-t-il de la viande au marché? 21. Il y en a beaucoup, il y a aussi du gibier. 22. Il y a du veau, du mouton, et de la volaille. 23. N'y a-t-il pas aussi des légumes et des fruits? 24. Il n'y en a pas. 25. Il y en a aussi.

EXERCISE 70.

Translate into French:—

1. Are you cold this morning? 2. I am not cold; it is warm this morning. 3. Is it foggy or windy? 4. It is neither foggy nor windy, it rains in torrents. 5. Is it going to rain or to snow? 6. It is going to freeze, it is very cold. 7. It is windy and foggy. 8. Is there anybody at your brother's to-day? 9. My brother is at home, and my sister is at church. 10. Is there any meat in the market? 11. There is meat and poultry. 12. Is it too warm or too cold for your sister in this room? 13. It is not so warm in this room as in your brother's library. 14. Are there good English books in your sister's library? 15. There are some good ones. 16. Are there peaches and plums in your garden? 17. There are many. 18. Do you remain at your brother's when it snows? 19. When it snows we remain at home. 20. Are there ladies at your mother's? 21. Your two sisters are there to-day. 22. Have you time to go and fetch them? 23. I have no time this morning. 24. Is your horse in the stable? 25. It is not there, it is at my brother's. 26. Does it hail this morning? 27. It does not hail, it freezes. 28. What weather is it this morning? 29. It is very fine weather. 30. Is it too warm? 31. It is neither too warm nor too cold. 32. Is it going to freeze? 33. It is going to snow. 34. Does it snow every day? 35. It does not snow every day, but it snows very often.

SOME ADVERBS AND PREPOSITIONS.

In simple tenses the adverb generally follows the verb, and is placed as near it as possible:—

Votre commis écrit très bien.	*Your clerk writes very well.*
Cette demoiselle lit tres mal.	*That young lady reads very badly.*

When a verb in the infinitive is accompanied by a negative, *pas*, *jamais*, or *rien* may precede the infinitive, as well as *ne*:—

Ne pas parler, ne pas lire.	*Not to speak, not to read.*
Ne jamais mentir; ne rien voir.	*Never to tell a lie; to see nothing.*

The adverb *assez*, meaning *enough*, *tolerably*, precedes adverbs or adjectives. *Assez de* precedes nouns:—

Vous écrivez assez correctement.	*You write pretty correctly.*
Vous avez assez de livres.	*You have books enough.*
Cet enfant est assez attentif.	*That child is attentive enough.*

Voici means *here is*; *voilà* means *there is*:—

Voici le livre que vous aimez.	*Here is the book which you like.*
Voilà le monsieur dont vous parlez.	*There is the gentleman of whom you speak.*

Dans is used for *in* or *into*, when the noun which follows it is preceded by an article, or by a possessive, demonstrative, or numeral adjective:—

Le crayon est dans le pupitre.	*The pencil is in the desk.*
Mettez cette lettre dans votre malle.	*Put this letter into your trunk.*

En is used for *to*, *in*, or *into*, coming after the verbs *to be*, *to go*, *to reside*, followed by the name of a part of the earth, a country, or province:—

Notre ami est en France.	*Our friend is in France.*
Vous allez en Italie.	*You go to Italy.*

The preposition *à* is used for the words *at* or *to*, *in* or *into*, before the name of a town, city, or village, preceded by the verbs mentioned above:—

Il va à Paris le mois prochain.	*He is going to Paris next month.*

The same preposition is used in the expressions, *à la campagne*, *à la ville*, *à la chasse*, *à la pêche*, etc.

Nous allons à la campagne.	*We go into the country.*
Vous n'allez pas à la ville.	*You do not go to the city.*
Je vais a la chasse et à la pêche.	*I go hunting and fishing.*

PRESENT INDICATIVE OF THE IRREGULAR VERBS.

CONDUIRE, *to conduct.*	ÉCRIRE, *to write.*	LIRE, *to read.*
Je conduis, *I conduct*, *do conduct*, or *am conducting*,	J'écris, *I write*, *do write*, or *am writing*,	Je lis, *I read*, *do read*, or *am reading*,
Tu conduis,	Tu écris,	Tu lis,
Il conduit,	Il écrit,	Il lit,
Nous conduisons,	Nous écrivons,	Nous lisons,
Vous conduisez,	Vous écrivez,	Vous lisez,
Ils conduisent.	Ils ecrivent.	Ils lisent.

MISCELLANEOUS EXAMPLES.

Votre parent écrit assez bien et assez vite.	*Your relation writes well enough and rapidly enough.*
Nous avons assez de livres.	*We have books enough.*
Allez-vous en France cette année?	*Do you go to France this year?*
Nous allons à Paris et à Lyon.	*We go to Paris and to Lyons.*
Demeurez-vous à la ville?	*Do you live in the town?*
Nous demeurons à la campagne.	*We live in the country.*
Allez-vous souvent à la chasse?	*Do you go often hunting?*
Nous allons quelquefois à la pêche.	*We sometimes go fishing.*

VOCABULARY.

Associé, m. *partner.*
Campagne, f. *country.*
Canif, m. *penknife.*
Chasse, f. *hunting.*
Commis, m. *clerk.*
Fort, *very.*
Pêche, f. *fishing.*
Prusse, f. *Prussia.*
Rapidement, *rapidly.*
Rend-re, 4, *to return.*
Suisse, f. *Switzerland.*
Terre, f. *farm*, *estate.*
Vite, *quickly.*
Voyage, m. *journey.*

Exercise 71.

Translate into English :—

1. Écrivez-vous encore la même leçon? 2. Je n'écris plus la même, j'en écris une autre. 3. Votre commis écrit-il rapidement? 4. Il écrit fort bien, mais il n'écrit pas vite. 5. N'avez-vous pas assez d'argent pour acheter cette terre? 6. J'ai assez d'argent, mais j'ai l'intention de faire un voyage en France. 7. Voilà votre livre, en avez-vous besoin? 8. Je n'en ai pas besoin, j'en ai un autre. 9. Avez-vous encore besoin de mon canif? 10. Je n'en ai plus besoin, je vais vous le rendre. 11. Notre cousin demeure-t-il à la ville? 12. Il ne demeure plus à la ville, il demeure à la campagne. 13. Aime-t-il à aller à la chasse? 14. Il n'aime pas à aller à la chasse. 15. Il va tous les jours à la pêche. 16. Notre associé est-il à Paris ou à Rouen? 17. Il est à Marseille. 18. Où avez-vous l'intention de conduire votre fils? 19. Je vais le conduire en Italie. 20. Demeurez-vous à Milan ou à Florence? 21. Je ne demeure ni à Milan ni à Florence, je demeure à Turin. 22. Votre ami demeure-t-il en Suisse? 23. Il ne demeure plus en Suisse, il demeure en Prusse. 24. Votre domestique est-il à l'église? 25. Non, Monsieur, il est à l'école.

Exercise 72.

Translate into French .—

1. Does your clerk write as well as your son? 2. He writes tolerably well, but not so well as my son. 3. Have you books enough in your library? 4. I have not books enough, but I intend to buy some more. 5. Here is your sister's letter, will you read it? 6. I intend to read it. 7. Does your son like to go fishing? 8. He likes to go fishing and hunting. 9. When does he like to go fishing? 10. When I am in the country. 11. What do you do when you are in the city? 12. When I am in the city I read and learn my lesson. 13. Do you intend to go to France this year? 14. I intend to go to Germany. 15. Will you go to the city if it rains? 16. When it rains I always remain at home. 17. How many friends have you in the city? 18. I have many friends there. 19. Are there many English in France? 20. There are many English in France and in Italy. 21. Are there more English in Germany than in Italy? 22. There are more English in Italy than in Germany. 23. Is it fine weather in Italy? 24. It is very fine weather there. 25. Does it often freeze there? 26. It freezes sometimes there, but not often. 27. Does that young lady read as well as her sister? 28. She reads better than her sister, but her sister reads better than I. 29. Is there anyone at your house? 30. My father is at home.

INDEFINITE PRONOUN *ON*, AND SOME IDIOMS.

The indefinite pronoun *on* has no exact equivalent in English. It may be rendered by *one*, *we*, *you*, *they*, *people*, etc., according to the idea to be expressed. It should be noticed that *on* is always used as a subject, and though it expresses an idea of plurality, the verb to which it is the nominative is always singular :—

On doit honorer la vertu.	*We should honour virtue.*
On nous apporte de l'argent.	*Money is brought to us.*

As may be seen in the last example, *on* is often the nominative of an active verb which is best rendered in English by the passive voice :—

On dit que votre épouse est ici.	*It is said that your wife is here.*
On raconte des histoires singulières	*Singular histories are related.*
On récolte beaucoup de blé en France.	*Much wheat is harvested (grown) in France.*

Avoir lieu answers to the English expression *to take place :—*

Cela a lieu tous les jours.	*That takes place every day.*

Au lieu de answers to the English *instead of*. The verb which follows it must be put in the infinitive :—

Au lieu d'étudier, il joue.	*Instead of studying, he plays.*

Devoir, *to owe*, is used before an infinitive like the English verb *to be* used emphatically, to express obligation ·—

Je dois lui écrire demain.	*I am to write to him to-morrow.*
Nous devons y aller demain	*We are to go there to-morrow.*

Recevoir des nouvelles means *to hear from :—*

Devez-vous recevoir des nouvelles de votre sœur?	*Are you to hear from your sister?*

Entendre parler answers to the English phrase, *to hear of* or *about :—*

Entendez-vous souvent parler de vos amis?	*Do you often hear of your friends?*

Miscellaneous Examples.

Que dit-on de nous dans la ville?	*What do they say of us in the city?*
On mange quand on a faim.	*People eat when they are hungry.*
On trouve beaucoup d'or en Californie.	*Much gold is found in California.*
Le concert doit-il avoir lieu ce soir?	*Is the concert to take place this evening?*
Il doit avoir lieu ce matin.	*It is to take place this morning.*
Il danse au lieu de marcher.	*He dances instead of walking.*

Vocabulary.

Afrique, f. *Africa.*
Alger, *Algiers.*
Apport-er, 1, *to bring.*
Diamant, m. *diamond.*
Dit-on, *or* on dit, *it is said.*
Fourn-ir, 2, *to furnish.*
Malade, *ill.*
Mois, m. *month.*
Or, m. *gold.*
Part-ir, 2, *to depart, to set out, to leave.*
Sav-oir, 3 ir. *to know.*
Vente, f. *sale.*
Voyage, m. *journey.*

Exercise 73.

Translate into English :—

1. Vous apporte-t-on de l'argent tous les jours? 2. On ne m'en apporte pas tous les jours. 3. Vous

fournit-on des habits quand vous en avez besoin ? 4. On m'en fournit toutes les fois (*every time*) que j'en ai besoin. 5. A-t-on besoin d'argent quand on est malade ? 6. Quand on est malade, on en a grand besoin. 7. Avez-vous reçu des nouvelles de mon fils ? 8. Je n'ai point reçu de ses nouvelles. 9. Ne dit-on pas qu'il est en Afrique ? 10. On dit qu'il doit partir pour Alger. 11. Quand doit-il commencer son voyage ? 12. On dit qu'il doit le commencer le mois prochain. 13. Ce mariage a-t-il lieu aujourd'hui ou demain ? 14. On nous dit qu'il doit avoir lieu cette après-midi. 15. Il aura lieu à cinq heures et demie. 16. Avez-vous envie de venir au lieu de votre frère ? 17. Mon frère doit venir au lieu de notre cousin. 18. Avez-vous l'intention de lui dire ce qu'il doit faire ? 19. Il sait ce qu'il doit faire. 20. Savez-vous ce qu'on dit de nouveau ? 21. On ne dit rien de nouveau. 22. Trouve-t-on beaucoup d'or en Californie ? 23. On y en trouve beaucoup. 24. Y trouve-t-on aussi des diamants ? 25. On n'y en trouve point, on n'y trouve que de l'or.

EXERCISE 74.

Translate into French :—

1. What do people say of me ? 2. People say that you are not very attentive to your lessons. 3. Is it said that much gold is found in Africa ? 4. It is said that much gold is found in California. 5. Do they bring you books every day ? 6. Books are brought to me every day, but I have no time to read them. 7. What is one to do when one is ill ? 8. One should send for a physician. 9. Do you send for my brother ? 10. I am to send for him this morning. 11. Do you hear from your son every day ? 12. I hear from him every time that your brother comes. 13. Does the sale take place to-day ? 14. It takes place this afternoon. 15. At what time does it take place ? 16. It takes place at half-past three. 17. I have a wish to go there, but my brother is ill. 18. What am I to do ? 19. You are to write to your brother, who, it is said, is very ill. 20. Is he to leave for Africa ? 21. He is to leave for Algiers. 22. Do you come instead of your father ? 23. I am to write instead of him. 24. Does the concert take place this morning ? 25. It is to take place this afternoon.

KEY TO EXERCISES.

Ex. 59.—1. Will you give this book to my brother ? 2. I can lend it to him, but I cannot give it to him. 3. Will you send them to us ? 4. The milliner can send them to you. 5. Do you show them to her ? 6. I see and show them to her. 7. Are you afraid to lend them to us ? 8. I am not afraid to lend them to you. 9. Can you not send us some fish ? 10. I cannot send you any, I have but little. 11. Will you speak to them of it ? 12 I will speak to them of it, if I do not forget it. 13. Do you often come to see them ? 14. I come to see them every morning and every evening. 15. Do you not speak to them of your journey to Poland ? 16. I speak to them of it, but they will not believe me. 17. Do I see my acquaintances on Mondays ? 18. You see them every day of the week. 19. Do they send you more money than our merchant's clerk ? 20. They send me (*of it*) more than he. 21. Do you send any to the bookseller ? 22. I send him some when I owe him (*some*). 23. Are you not wrong to send him some ? 24. I cannot be wrong to pay my debts. 25. They give you some, and they lend you some when you want it.

Ex. 60.—1. Voulez-vous nous envoyer cette lettre ? 2. Je veux vous l'envoyer, si vous voulez la lire. 3. Je veux la lire, si je puis. 4. Pouvez-vous me prêter votre plume ? 5. Je puis vous la prêter, si vous voulez en avoir soin. 6. Puis-je parler à M. votre père ? 7. Vous pouvez lui parler, il est ici. 8. Avez-vous peur de l'oublier ? 9. Je n'ai pas peur de l'oublier. 10. Voulez-vous les lui envoyer ? 11. J'ai l'intention de les lui envoyer si j'ai le temps. 12. Est-ce que vous lui parlez (*lui parlez-vous*) de votre voyage ? 13. Je lui parle de mon voyage. 14. Je leur en parle. 15. Pouvez-vous le lui communiquer ? 16. J'ai envie de le lui communiquer. 17. Voyez-vous vos connaissances tous les lundis ? 18. Je les vois tous les lundis et tous les jeudis. 19. Où avez-vous l'intention de les voir ? 20. J'ai l'intention de les voir chez M. votre frère et chez Mlle. votre sœur. 21. Pouvez-vous l'y envoyer tous les jours ? 22. Je puis l'y envoyer tous les dimanches, s'il le veut. 23. Pouvez-vous me les donner ? 24. Je puis vous les donner. 25. Qui veut leur prêter des livres ? 26. Personne ne veut leur en prêter. 27. Est-il à la maison ? 28. Il est chez son frère. 29. Voulez-vous nous l'envoyer ? 30. Je veux vous l'envoyer, si vous en avez besoin. 31. Voulez-vous nous les donner ? 32. Nous voulons les donner à vos connaissances. 33. Leur y en avez-vous envoyé. 34. Oui, je leur y en ai envoyé.

Ex. 61.—1. I have seen him and his father. 2. We recognised her mother and her. 3. Thou hast slandered me, her, and them. 4. Have you noticed the countess and him ? 5. They have supported thee and thy cousin with all their credit. 6. I know only him here. 7. He wishes to see her only. 8. In three months, thou hast written to me only twice. 9. He has looked at you only once. 10. Did your clerk write to you and to your partner ? 11. Yes, he wrote several times to my partner and to myself. 12. Your calumnies have injured her, him, and me. 13. They have sent us to you to settle this business. 14. Your mother has sent you to me that I may introduce you to them. 15. My guardian has entrusted me to her, because he knows nobody but her in this town. 16. We ran up to him as soon as we caught sight of him. 17. Your brother will have recourse to you in case of need. 18. The king applied to them several times. 19. Look out ! (*Take care of thyself.*) 20. She spoke only to you. 21. Observe them.

Ex. 62.—1 Avez-vous vu elle et son père ? 2. As-tu reconnu sa mere et lui ? 3. Ont-ils calomnié toi, lui, elle, et moi ? 4. Nous avons vu la baronne et lui. 5. Ils ont appuyé votre oncle et vous de tout leur crédit. 6. Je ne connais qu'elles ici. 7. Nous ne voulons voir qu'eux. 8. En un an, elle ne m'a écrit qu'une seule fois. 9. En trois heures, vous ne m'avez regardée qu'une seule fois. 10. Mon commis a écrit à vous et à votre associé. 11. Avez-vous parlé plusieurs fois à eux et au prince ? 12. Pourquoi avez-vous nui à elle, à lui, et à moi ? 13. Vous ont-ils envoyé à moi pour terminer notre affaire ? 14. Votre père m'a envoyé à vous, pour que vous me présentiez à elle. 15. Le général m'avait confié à eux parce qu'il ne connaissait qu'eux dans cette ville-là. 16. Ma mère courut à moi, et me dit qu'elle avait toujours pensé à moi. 17. Ceci a rapport à moi. 18. Nous nous fions à eux. 19. Il faut prendre garde à soi. 20. Je ne veux écrire qu'à vous. 21. Ils ont fait attention à nous.

HUMAN PHYSIOLOGY.—X.

[*Continued from p.* 150.]

VOICE AND SPEECH.

THE faculty of voice, or rather of articulate utterance, is one of the great distinctive features of the human race. Though in nearly all the air-breathing animals included in the division Vertebrata there are arrangements more or less complex for the production of vocal sounds, there is no reason to suppose, as far as observation has at present gone, that any animal but man is endowed with the wonderful gift of speech. Without this power how different would be the condition of the human family; without speech, learning and civilisation could hardly have existed, and life would have been robbed of its greatest charms.

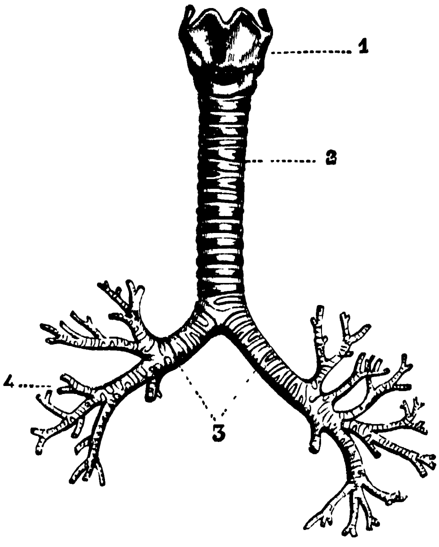


Fig. 23.—LARYNX, TRACHEA, AND BRONCHI.
1, Larynx; 2, Trachea; 3, Right and Left Bronchi; 4, Bronchial Tubes.

In the lower animals the organs of sound vary much in character. In reptiles, the apparatus is situated at the junction of the windpipe with the pharynx, and is of very simple construction, consisting only of a slit bounded by two contractile lips; and in consequence, the only sound these animals for the most part are capable of uttering is a hissing one, which, from the great size of their respiratory organs, is often prolonged for a very considerable period. In birds, especially the singing birds, the vocal organs are of a much more complex character. In them, as in the reptiles, there is a narrow fissure at the superior extremity of the windpipe; but this, in their case, seems to be only concerned in the function of respiration. The true vocal apparatus is situated at the lower extremity of the trachea, just before it divides into the two bronchi. In shape it resembles a bony drum, formed by the last ring of the trachea with a cross-beam of bony structure; stretched over this, and attached to the osseous cross-beam, is a thin semilunar-shaped membrane. This drum communicates below with the apertures of the two bronchi, each of which terminates in two lips or vocal cords. Muscles, varying in number according to the species of the bird, are attached to the different parts of the drum, and these, by their action, stretch more or less strongly the membrane, and so modulate the sound. In the birds that have no voice, or rather have no song, these special muscles are absent.

The organ of voice in man, the *larynx*, is situated at the upper part of the *trachea* or windpipe, intervening between it and the posterior opening of the mouth (Fig. 23). It is formed of various cartilages connected together by membrane. It will be necessary to describe these rather particularly before we can understand the way in which the vocal sounds are produced. The cartilages of which the larynx is composed are five in number, in addition to which four small cartilaginous bodies are named; but these latter play no important part in this function. The five material cartilages are the *thyroid*, *the cricoid*, *the two arytenoid*, and *the epiglottis*. Of these the *thyroid* is considerably the largest; it consists of two square-shaped pieces of cartilage, joined together in front at an acute angle, and forming that projection in the middle line of the throat which is known as *pomum Adami* (Adam's apple). The posterior surfaces terminate both above and below in two cornua, or horns; the upper give attachment to the membrane which connects the thyroid cartilage with the hyoid bone, and the lower articulate with the cricoid cartilage. Posteriorly, the sides of the thyroid do not meet, but leave a considerable opening, which is completed partly by membrane and partly by the cartilage next to be considered. The *cricoid* cartilage derives its name from its shape, resembling that of a signet ring; it has the smaller part of the ring in front, and is altogether smaller but thicker than the thyroid, and forms the principal part of the posterior cartilaginous wall of the larynx. Its anterior half, which is narrow, gives attachment to numerous muscles, and the membrane which connects it with the inferior borders of the thyroid; its posterior half is broader, and fills up part of the space left vacant by the receding walls of the thyroid, with which it articulates. The upper border of its posterior surface presents two little facets, each of which articulates with one of the arytenoid cartilages.

The *arytenoid* are small pieces of cartilage, pyramidal in shape, and are attached by their bases to the posterior upper border of the cricoid cartilage, and thus help to complete the hinder wall of the larynx; the articulation they form with the cricoid is one in which considerable freedom of movement is permitted, and is a most important provision for the performance of the vocal function.

The *epiglottis* is a thin leaf-shaped piece of fibro-cartilage, of yellowish colour, placed behind the tongue in front of the upper opening of the larynx, which it protects. During respiration it stands erect, leaving the opening of the larynx free; but when the act of swallowing has to be performed, it curves backwards and downwards, and completely closes the aperture of the windpipe. The thyroid, the cricoid, and the arytenoid are joined together by membrane, which also closes any opening not occupied by cartilage; so that the larynx is in shape a triangular box, flattened behind and at the sides, whilst in front it presents a prominent vertical ridge. Externally it is covered, save in some parts of the middle line where it is sub-cutaneous, by the numerous muscles of the neck, and along its sides run the great blood-vessels and nerves of the head. Internally, the larynx is lined by mucous membrane, which is continuous above with that of the mouth, and below with that of the trachea and lungs; and presents for examination the essential part of the vocal apparatus, the vocal cords.

In looking down the larynx, we notice, first, that the opening is heart-shaped, narrower behind than before, and that it slopes obliquely downwards and backwards; in front there is placed the epiglottis, behind the upper points of the arytenoid cartilages. A short distance down we observe that the mucous membrane is drawn into two folds, which run one on each side from before backwards; these are the *superior* or *false vocal cords*, so called because they resemble in appearance, and partly in structure, the true vocal cords, but have no concern in the production of the voice. A little lower down the larynx we find another pair of folds or cords taking the same direction as the first pair: these are the *true vocal cords;* they are attached in front to the inner surface of the sides of the thyroid cartilage, close to the angle formed by their junction. Posteriorly, each cord is connected with the anterior angle of the base of an arytenoid cartilage. Into the composition of these, as in the false vocal cords, mucous membrane largely enters, but in addition each cord contains ligamentous structure and yellow elastic tissue. The small space or chink which exists between the true vocal cords is called the *glottis*, or *rima glottidis*. This is the narrowest part of the larynx; in the male it is generally nearly an inch in breadth when dilated to its widest extent; the measurement in the female is rather less. In order to bring these mechanisms into play a complex arrangement of muscles is provided: these consist of two sets—the first, which are extrinsic to the larynx, and have other duties to perform besides influencing the production of sound; and another set intrinsic to the larynx, which are entirely devoted to this purpose. They may also be divided into two classes, in accordance with the effects they produce: thus, first, the muscles which relax the vocal cords, and thus open the glottis; and second, the muscles which tighten or make tense the vocal cords, and so close the glottis.

The vocal cords being attached in front to the thyroid cartilage, and behind to the anterior angles of the bases of the arytenoid, it is necessary that, in order to affect them, the muscles should act either upon the thyroid or the arytenoid cartilages. So we find one group of muscles specially acting upon the thyroid; one set of them drawing it down over the cricoid cartilage, making tense the vocal cords, and so closing the glottis; another set antagonistic to the first, which elevate the thyroid, relax the cords, and open the glottis. The arytenoid has also a group running from it to the cricoid: one pair draw upon the base of the arytenoid, rotate it outwards and backwards, and so tighten the cords, and at the same time open the posterior part of the glottis; another pair close the glottis, by rotating the bases inwards. A pair of muscles, running from the arytenoid to the thyroid, draw forward the arytenoid, and together relax the cords and open the glottis; while another pair, specially belonging to the last-named cartilages, draw them close together, and bring the vocal cords almost into contact. In addition to these, there are many other muscles which play more or less important parts with reference to this function.

Having now considered the structure of the larynx, we must pass on to describe the way in which it fulfils its special duties. By numerous observations, both on the living subject and the dead body, it has been conclusively shown that the production of sound is the result of the action of a current of air upon the inferior or true vocal cords. In the ordinary condition of the larynx, the air passes and re-passes through its canal without causing any sound; but if the cords are made tense, by the action of the muscles of the larynx, sounds are immediately produced. By some observers the sounds are supposed to be the result of the vibrations caused in the cords by the impinging of the air upon them—similar, indeed, to those of a stringed instrument, as the violin; others compare the action of the vocal cords to that of the reeds of the hautboy or clarionet, or the tongue of the accordion or concertina. It is most likely that it resembles the action of both classes of instruments, as it has been proved that the cords vibrate strongly through their whole length; and that, in order to produce acute or shrill sounds, it is necessary that the cords should be approximated, and the glottis reduced to very narrow limits. It is also found that, in order to produce true vocal sounds, it is necessary that the cords, in addition to being made tense, should have their inner edges parallel. Even when the lips of the glottis are most completely closed anteriorily, the hinder portion still presents a wide gap, from which it is inferred that the front part is concerned in the vocal function, and that the posterior portion is subservient to respiration simply.

Animal sounds are divided into the cry, the song, and the voice, ordinary or acquired. The cry is the sound usually produced by the lower animals, is not modulated, and is generally sharp and disagreeable. In man, the cry is generally an instinctive act, not a voluntary one, and expresses usually agony or distress; the human infant can utter no other sound, and it is only by imitation that he learns the art of producing articulate sounds. The song is the result of a succession of sounds, each of which has a certain number of vibrations, and in which the number of vibrations of each succeeding note bears the same relative proportions as characterise the notes in the musical scale.

Male and female voices differ in *pitch*—that is, they commence and finish at different points in the musical scale—and in "*timbre*" or *quality*. In each the compass of the trained voice is much the same, and covers usually from two to three octaves. The lowest note of the female is about an octave higher than the lowest note of the male voice, and the highest note of the female voice is also an octave higher than the highest male note. The female and male voices are subdivided, the female into soprano and contralto, the male into bass and tenor. These differ from each other in tone; the bass goes lower down the scale than the tenor, and is stronger in the low notes; the contralto stands in the same position to the soprano; the tenor extends higher than the bass, and the soprano higher than the contralto, and each is stronger in the high notes than the bass or contralto. The voices called mezzo-soprano and baritone are intermediate voices, the mezzo-soprano being midway between the soprano and the contralto, and the baritone intervening between the tenor and the bass.

This difference in pitch of the male and female voices is dependent on the length of the vocal cords: in the male, the length of the cords when at rest is generally about $\frac{73}{100}$ of an inch; and when they are stretched to the greatest extent, about $\frac{93}{100}$ of an inch; in the female the length varies from $\frac{51}{100}$ to $\frac{63}{100}$ of an inch. Thus the difference between the male vocal cords when quite relaxed, and when made tense to the greatest degree, is only the $\frac{20}{100}$ or $\frac{1}{5}$ of an inch; whilst in the female it is still less, being but $\frac{12}{100}$ or a little less than $\frac{1}{8}$ of an inch. Yet this slight variation in length is enough to account for the difference between the male and female voices. And not only so, but as in producing each note or semitone in the musical voice the vocal cords are relaxed or made tense to the exact degree necessary, it follows that, as the voice covers two octaves or twenty-four semitones, the performer must have the power of dividing his vocal cords into parts no greater than the $\frac{1}{1200}$ of an inch, and this in ordinary vocalisation. In some noted singers it was calculated that this power of division was carried as far as the $\frac{1}{10000}$ of an inch. And this appears even more wonderful when we remember the complex arrangement of muscles by which it is effected, and that not one of those muscles is separately under the control of the will. The difference of timbre or quality of the notes depends on the character of the walls of the larynx; in women and children these are more flexible and smoother than in men. The male voice owes its greater roughness to the greater hardness and firmness of the cartilages of the male larynx, approaching nearly, and in old age often quite, to ossification. The larynx of boys resembles that of women; but as they approach manhood it assumes a more masculine character, and the voice begins to change, or, in common parlance, "to crack"; and until the change is completed the voice is imperfect, and unfit for singing.

From what has been said, it is evident that the height of note in the musical voice depends upon two things: the degree of tension of the vocal cords and the width of the glottis. In producing the extremely high notes the cords are so closely approximate that they appear actually to touch along their anterior portions. The loudness of the voice is regulated partly by the force with which the air is expelled from the lungs, and partly by the size of some parts of the larynx. In some of the animals belonging to the class Mammalia, large cavities or pouches exist, opening into the larynx, which give great resonance and loudness to the voice. These structures are met with in the ass, but more markedly in the howling apes of America, which, though but of comparatively very small size, are said to make more noise than the roaring of a lion, and to be distinctly audible for a space of two miles. The epiglottis, by being pressed down so as to cover the upper part of the larynx, helps to render the notes deeper in tone.

All singers, but more markedly men, have the power of producing two entirely different series of notes—one, the notes of the natural voice or chest notes, and the other the falsetto notes. The chest notes have a fuller sound, and produce a stronger sense of vibration than the falsetto. The lowest notes of the voice can only be produced by the chest, the highest only by the falsetto; the medium may be sung by either voice. We have seen that the natural voice notes are produced by the vibrations of the vocal cords, brought into more or less close approximation to each other: the way in which the falsetto notes are produced is much disputed. Some physiologists consider that they are not dependent on the vibrations of the vocal cords themselves, but are caused by the vibration of the air rushing through the glottis, which they believe at this time assumes the shape of the *embouchure* of a flute. Other observers assert that in the production of falsetto notes the surfaces of the vocal cords are not approximated, but simply their edges, and that this accounts for the difference between the two kinds of notes. The matter cannot, however, be considered to be settled at present.

The articulate voice resembles the cry so far as the absence of any sustained musical tone, but differs from it both in quality, and in its being always modified by the will. Man is not the only animal that has the power of uttering articulate sounds; but he is the only one that is able to attach meanings to the words he utters, *i.e.*, he is the only one that can be said to have the power of speech.

The special organs of articulation are the *pharynx*, the nasal *fossæ*, the *mouth*, and the *tongue*, but persons in whom the tongue has been removed for disease are yet found to articulate with tolerable distinctness. The mechanism of the larynx is not essential to the performance of this act, as is shown by the fact that in whispering, though no laryngeal sound is produced, yet we may articulate quite distinctly. The number of sounds capable of being produced by the human voice are infinite; some are so easily uttered as to appear almost spontaneous, whilst others can only be produced by long practice. No language utilises all these sounds, but those easiest to be produced enter into the composition of almost every tongue.

The various sounds used in speech are usually divided into two great classes, vowels and consonants. Of these the vowels are, for the most part, the easiest to be sounded: for their production it is only necessary that the exit of air from the mouth should be as free as possible, and that the parts, when once put in the proper position, should retain that position till the sound is concluded; they are continuous sounds, modified by the form of the aperture of the mouth. Thus, in sounding *ah* the mouth is open to its fullest extent, the tongue is depressed, and the hanging curtain of the palate is drawn up, so that the air escapes from the mouth without any check. In making the sound expressed in English by *oo*, the same arrangement is carried out, but the aperture of the mouth is narrowed: in the same way, if the other vowel sounds are tried, it will be found that they are varied by the form of the aperture of the mouth, and that the parts remain fixed.

To produce the consonants (so called because most of them cannot be sounded without the aid of a vowel), a certain degree of movement of the parts concerned in their production is necessary, and the breath, in consequence, suffers a more or less complete interruption in its passage through the mouth. These have been divided into two main classes: the first called explosives or mutes, which necessitate that the breath should be completely stopped at the moment previous to their production; the second, continuous, in which the breath only receives a partial check, and the sound, like the vowel, is continuous. In pronouncing the consonants contained in the first class, of which *b*, *p*, *d*, *t*, *k* may be taken as examples, the posterior orifices of the nose are completely closed, and all the air is driven through the mouth; in pronouncing *b* and *p* the air is stopped by the shutting together of the lips; in pronouncing *d* and *t*, by the contact of the tongue with the front part of the roof of the mouth: this latter arrangement is also used for pronouncing the hard *g* and *k*, the difference consisting in the degree and extent to which the tongue is brought in contact with the roof. In the other class the nose is open, and the air is allowed to pass more or less freely through it, as in *m*, *n*, etc.; but in others, as *v*, the air is not allowed to enter the nose; still, in all the consonants included in this class, the sound is capable of being prolonged to an almost indefinite extent. Such is the apparatus whereby voice is produced in man. Articulate speech, it is evident, means much more than voice, in that it implies the action of brain and mind in moulding mere sounds to form words, and these again are the outcome of that power of thought which is the prerogative of mankind.

HISTORIC SKETCHES, ENGLISH.—X.

[*Continued from p.* 154.]

KING CHARLES'S VETO ON EMIGRATION.

CRUEL as was the fate of King Charles I., no doubt he deserved punishment for his numerous deeds of tyranny and his policy of determined misgovernment. One act of his, or rather let us call it one act of his government, recoiled more upon his head than ever foul cannon recoiled upon the gunner.

Eight vessels were lying in the Thames in the early part of the year 1637, bound for "the plantations" in America. When they were about to sail an order came from the king in council forbidding the masters of them to weigh anchor. Obedience was exacted by the royal officers from the all-unwilling masters, and the intending passengers were compelled to land again, to disembark their baggage, and to renounce the object of their voyage. The ships were emigrant ships, laden with colony-founders' stores, and intended for colonists' use; the people who had taken passage in them were of the stuff from which colonies —nay, empires—are made; and their object in going was to establish a settlement where politics and religion, which were discouraged at home, might have freedom to live and liberty to grow. An embargo was laid upon the ships, and for the time their departure was delayed. Some of the would-be voyagers never pursued their journey; they refused to give the guarantees which were required of them before they could get licence to go; they returned to their homes and made themselves names in English history for ever. Among them were—John Hampden, who first tried conclusions with the king by refusing to pay a tax levied by the royal authority alone; Sir Arthur Hazelrig, one of the most determined enemies the kingly power ever had; John Pym, the future leader of the House of Commons, and promoter of all the constitutional resistance which Parliament subsequently offered to the king's illegal pretensions; and—Oliver Cromwell! These and many kindred spirits were flying from tyranny and oppression at home, going with their worldly wealth to follow in the footsteps of the Pilgrim Fathers, who a few years before had sailed across the Atlantic, and founded in the wild regions of the West a colony where freedom was to flourish till it grew up and overshadowed the land. They hoped, across the wide ocean, to find a home where the fury of the oppressor should cease.

Had these eight ships sailed; had Cromwell, and Pym, and Hampden, and the rest been suffered to depart, how differently might not English history have been written! None, of course, can tell whether, among the noble army of patriots who at that time thronged Parliament, there might not have been found another Hampden to resist unjust taxation, another Pym to impeach Lord Strafford, another Cromwell to strike home for his country; but taking the men as they were at the time, and considering what they afterwards became, it is excusable to speculate upon what different scenes would have presented themselves, had not the unlucky order of embargo been issued from the Privy Council. Fate was cruel to Charles I.

But why were these men going? England had not only been their home but their forefathers' for generations. Cromwell's family counted among its recent members, as poor Charles afterwards found, and tried to use the knowledge in bribing his enemy—that same Thomas Cromwell who was secretary to Cardinal Wolsey, and who, after that statesman's fall in 1530, had risen in King Henry's service, till he became Earl of Essex, and was finally promoted to the honour of being executed, by order of the master he had served too well—the master "whose commands," as Hallam tersely observes, "were crimes." The other emigrants were no less illustrious, no less bound by the strongest ties to the land of their birth. What motive could they have for voluntarily forsaking all that was dear to them in nationality, and for turning their backs upon the country they loved? Disgust at things as they were in the country, and despair of ever seeing them become better.

> "We strove for honours—'twas in vain: for freedom—'tis no more,"

they might have said, in their bitterness of soul, with the indignant Roman citizens.

Henry VII. had begun that system of ruling by virtue of his own strong will, which the nation afterwards, for national purposes and under circumstances of national danger, allowed Elizabeth also to exercise. We might, perhaps, go even farther back, and say that the "popular despotism" which characterised the Tudor rule was not his invention, but that of that cunning politician Edward IV., the man above all others who knew how to play off class against class, how to debase the nobles and pamper the mob. Such was the policy of two dynasties of English kings, against which the Great Rebellion was the inevitable reaction. But even under Elizabeth, beneficent and nationally glorious as her reign was, the people, by their representatives in Parliament, were perpetually striving to put a bridle on that sovereign power which the queen was so fond of wielding.

They loved her much, but they loved their children more, and they would not suffer her to forge chains for freeborn limbs, nor permit that they and theirs should breathe but by royal permission. When the dangers which caused the people for a while to submit themselves wholly to her had passed away, no time was lost in winning back rights and privileges which Elizabeth and Mary and their high-handed father had taken into their own hands. In the re-conquest it was inevitable that collisions should take place between the queen and the Parliament, and collisions did actually take place; but owing to the perseverance of the House of Commons, and to the great good sense of Elizabeth, who always knew when to loosen the reins which were being held too tight, the result of these disputes was, on the whole, favourable to right and liberty, and never cost the queen a whit of her people's affection. But when she died, in 1603, and was succeeded by James of Scotland, there were still some ugly instruments at the disposal of the Crown against the liberty of the subject. The wisdom of Elizabeth's advisers had used these instruments sparingly, and had kept them as much as possible out of sight. They were now to fall into hands which knew not how to wield them wisely—hands which clutched the blade instead of the hilt of the weapon, and got themselves badly cut accordingly. The collision which was avoided by the dull moderation of James was precipitated by the rashness of his successor.

The instruments in question were the courts of the Star Chamber and High Commission, tribunals unknown to the common law of the land, exercising a jurisdiction quite incompatible with the existence of liberty, and apt to become the means of all sorts of oppression and wrong. It would take too long to examine here the whole history of these courts. With regard to the former of them, the Star Chamber, much ignorance prevails, and advantage has been taken to throw a sentimental and false colour upon its actions, with a view to making it an element in the composition of historical romances. It will be sufficient to say that it was a court composed of the king himself, and such members of his Privy Council as he chose to summon; that it took cognisance of certain offences not then noticed as such by the ordinary law courts, such as libel and slander; and also assumed a right to take any case it chose from the consideration of the regular courts of law, and especially the criminal courts, and deprived a man in this way of the right of trial by his peers, which had been secured for him by Magna Charta. The lords of the council were at once judges and jury, even in cases where the crown was concerned; there was not any appeal from their decision, and the sentences of the court were often most ruinous (notwithstanding the clause of the Great Charter which forbade any man to be fined to such an extent as would prevent his getting a livelihood), even where they did not condemn a man to imprisonment, and sometimes to torture. Any punishment short of death—and many of the punishments came only just short of it—the court of Star Chamber asserted its power to inflict; and the claim having been put forward in action at a time when men were not able to question it, came at length to be looked on almost as a matter of course, except by those who suffered by it, and by those faithful guardians of the liberties of England who only bided their time to announce that the court itself was an illegal thing, and ought to be abolished.

The High Commission was a tribunal invented under Queen Elizabeth, a sort of clerical Star Chamber, composed of ecclesiastics, who made it their business to "sniff out moral taints," and to persecute anyone who worshipped God in any other way than that prescribed by the Church of England. It was armed with power to fine and imprison, and this power it used till resistance became so strong, even under Elizabeth, that it was deemed prudent to admonish it from above. It was the Protestant Inquisition; but Englishmen were not Spaniards, and the seeds of priestly tyranny were crushed ere they could grow into a plant. Still it existed, in company with the Star Chamber, which ever waxed more and more intolerable in its administration under the successors of Elizabeth.

Men had endured much from the Tudor princes, as they always will endure at the hands of rulers whose strong personal character makes them respected, even though feared; but from princes of the House of Stuart they were by no means ready to put up with insult and oppression; so that when members of Parliament were cited to appear in the Star Chamber to answer, as to a crime, for language spoken by them in their place in Parliament, they resisted, and remonstrated with the king, and declared what he had done to be a breach of privilege of Parliament. Against other acts of the Star Chamber and of the government the Houses also protested, and Puritans in politics, as well as in religion, who had been trained up in Elizabeth's Parliaments, and who sat in the Parliaments of James, uttered their words of remonstrance and warning, not fearing even the dismal dungeons in the Tower, which the chances were would be their reward for their boldness.

The king was cunning, his government was weak; the Parliament men were for the most part noble, and unquestionably they were strong; so all through the reign of James I, 1603—1625, there were perpetual conflicts between the sovereign and the people; and though, when the king died, the Crown had not given up any of its so-called prerogatives, there had been conjured up a deep spirit of resistance to them, a spirit which found expression in the reign of James's successor, his ill-fated son Charles I.

But much had yet to be borne before order-loving, law-fearing Englishmen could be induced to rise up and say, "This thing shall not be." With a government as weak or weaker than James's, Charles pretended even greater claims than his father, and exercised his prerogative even more annoyingly and more tyrannically. He levied certain taxes on the people, not only without the consent of Parliament, but in direct contravention of several statutes; he issued proclamations, and required them to be obeyed as laws; he resented the offer of advice as unwarrantable interference; and he refused finally to summon the counsellors whose advice was always so unpalatable. Brought up in the notion that kings are appointed directly by God, and that the Church of England was also of Divine institution, he put forward offensively his own claims on the one hand, and backed with all his might the claims of the Church on the other. In order to do this he was necessitated to employ very extensively, in the face of increasing opposition, the two courts of which mention has been made.

Two members of Parliament, Sir John Eliot and Sir Dudley Digges, were imprisoned by order of the Star Chamber, for "seditious" words used by them, as members, when the Duke of Buckingham was impeached. When, however, the House refused to vote supplies till its members were released, the king, though sorely against his will, was forced to give way. Then came a series of attacks on the constitution by the king and his ministers, which were repelled with more or less damage to the good-will between him and his people; the king tried to govern without Parliament, and Parliament was resolved there should be no peace for him if he did. With the Earl of Strafford as chief adviser in State affairs, and Archbishop Laud as head of the Church, Charles strove to make himself an absolute king, caring little, apparently, how roughshod he rode over the feelings and affections of his people. The honour of the nation was forfeited by a disgraceful foreign policy, pirates from Morocco were allowed to prey upon ships in the English Channel, the influence of England abroad had sunk to zero, and at home all power and statesmanship were directed to the one object of laying the nation, bound hand and foot, at the feet of the king.

The Star Chamber was set in motion against the opponents of the kingly power, and indeed against all who ventured to criticise the actions of government. Sir David Foulis was fined £5,000 for dissuading a friend from paying an unlawful tax; Prynne, a barrister of Lincoln's Inn, for an abusive book he had written against some of the practices in the king's household, and against the ultra-High Church practices of the primate, was sentenced to be disbarred, to be put in the pillory at Cheapside and at Westminster, to have both ears cut off, to be fined £5,000, and to be imprisoned for life! People were ruinously fined for turning their arable land into pasture, in contravention of some obscure law of Henry VII.; for refusing to lend money to the king; and for encroaching on the royal forests. One man, Morley, was fined £1,000 for reviling and striking one of the king's servants at Whitehall; another, named Allison, was fined £1,000, imprisoned, and pilloried at Westminster, for having said falsely that the Archbishop of York had incurred the king's displeasure. For calling the Earl of Suffolk "a base lord," Sir Richard Granville was ordered to pay £4,000 to the earl and £4,000 to the king; Sir G. Markham having thrashed Lord Darcey's huntsman for abusing him, and having promised to do the like by Lord Darcey, should he approve his servant's conduct, was fined £10,000.* Landed proprietors being ordered by the king's proclamation not to live idly in London, but to go to their estates, were fined in the Star Chamber for non-compliance. In 1637 Burton, a divine, and Bastwick, a physician, were condemned for sedition and schism to the same punishment as had been inflicted on Prynne; and that unfortunate man, having again offended, was further mutilated and fined another £5,000. Williams, Bishop of Lincoln, was fined £10,000, and sent to the Tower, for some trumpery offence against Laud; Osbaldistone, the master of Westminster School, for having nicknamed Laud in a letter to Williams, was ordered to be pilloried before all his school, and to pay £5,000, but he saved himself by flight. Lilburne, charged with distributing seditious pamphlets, was whipped by the hangman, pilloried, and imprisoned with irons on him.

It was under circumstances like these, when despair seemed to have seized the minds of men; when the king was hurrying forward headlong in a career of violent misgovernment, and no one was found to stand in his way and stop his mad course; when oppression seemed to be triumphant, and right and justice were openly trodden under foot; when honour had gone from England, and the homes of her people were no longer pleasant places—that Hampden, and Pym, and Hazelrig, and Cromwell proposed to quit her shores and begin life anew in America. The royal order, arbitrarily issued, prevented them as we have seen. They returned to their homes and their duties, and when compelled as a last resource to summon Parliament, whose advice he had not sought for eleven years, the king again addressed the House of Commons, these men were in their places, resolved to do their duty to the uttermost, some will even say to exceed it.

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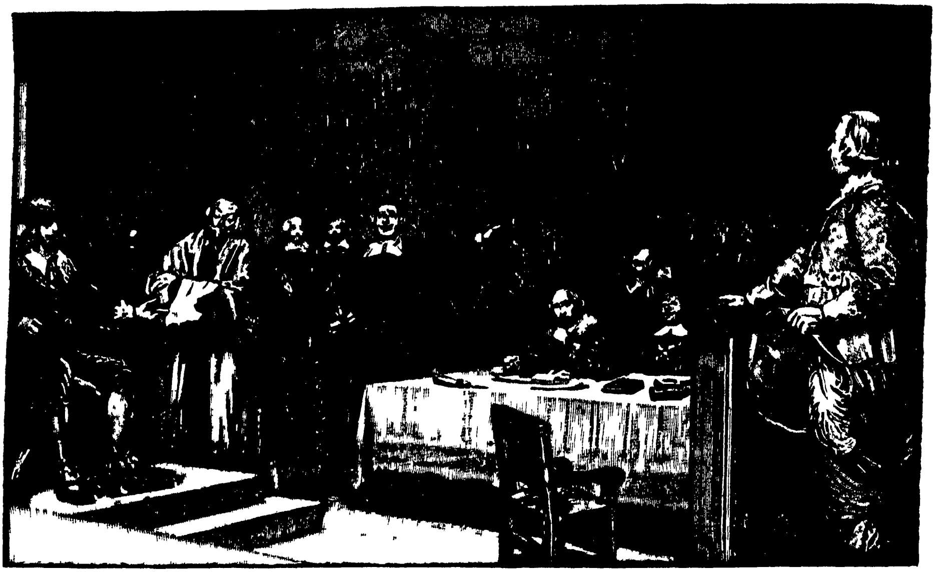
* This case occurred in the previous reign, but it shows the tension to which the power of the court could be strung.


A TRIAL BEFORE THE COURT OF STAR CHAMBER

Be that as it may, of the men whom Charles's order stopped from emigrating, Hampden in the same year brought forward the question of the king's right to levy taxes, when he resisted even to trial the demand which was made on him for ship-money; and he fell subsequently, mortally wounded, at Chalgrove, early in the war between the king and the Parliament. Sir Arthur Hazelrig was foremost among the more intemperate enemies of the king in all the subsequent troubles, but he did not identify himself remarkably with any of the great questions upon which the sword had finally to pronounce judgment. Of Pym much, but scarcely enough, has been written. Unselfish, truly persuaded as to the course he was pursuing, unswerving in his fidelity to that course, incorruptible, calm amidst tumults, a fountain of wisdom in a sea of folly, he was eminently fitted for the post which he a long while filled, that of leader of the popular party in the House of Commons. He was the framer of the articles of impeachment against the Earl of Strafford, the supporter of the impeachment of Laud, the life and soul of all the constitutional opposition which the Parliament made to the king. His name is not to the warrant for the execution of Charles I. (January 30, 1648–49), though with Hampden, Hazelrig, and two more, he was one of those five members whose arrest the king in 1641 endeavoured to effect in person, but found that his birds were flown. His name stands out brilliantly among those advanced patriots and purely disinterested men who in 1641, immediately after the execution of Lord Strafford, wrung from the king a consent to the abolition by statute of the courts of Star Chamber and High Commission.

Of Oliver Cromwell, the fourth man among the detained, it is unnecessary now to write. Much has been said for him; much more, but less weighty, has been said against him; but his name and his character have brightened since the light of honest critical inquiry was turned upon him. Some there are who cannot admire him enough for his policy, which raised the foreign influence of England to a

height it had not attained since Henry the Fifth was crowned in France, and which at home brought order, albeit by a stern method, out of the chaos into which the Great Rebellion had thrown all things. Others there are who seem to think that nothing can atone for usurpation, and who can never forgive or forget the fact that Cromwell's name appears among the first signatures on Charles's death-warrant, and that but for him that death-warrant would never have been written. Whatever opinion we hold, we cannot fail to admire his massive intellect, his great energy of purpose, and his untiring perseverance in the execution of what he believed to be "stern necessity."

See:—S. R. Gardiner, *The Puritan Revolution; Cassell's History of England.*

LATIN.—X.

[*Continued from p.* 158.]

PARTICLES.

THERE yet remain to be considered several less important parts of speech, which for the most part are uninflected, and yet are of considerable importance in the Latin language. These parts of speech, which are sometimes classed together under the name of particles, are *adverbs*, *prepositions*, *conjunctions*, and *interjections*. They are all indeclinable, so that all you have to learn with regard to them is their usage.

ADVERBS.

An adverb is a word which is used with a verb or adjective to limit in some way or other its meaning. Adverbs may be divided into four classes, according as they express relations of (1) Manner, (2) Place, (3) Time, (4) Number. These classes are known by grammarians as Modal, Local, Temporal, and Numeral Adverbs.

1. Modal Adverbs.

Among adverbs of manner may be classed such particles as the following:—

(*a*) **Sic**, **ita**, *so*, **aeque**, *equally*, **partim**, *partly*, **satis**, *enough*, **clam**, *secretly*, **similiter**, *in like manner*, **aliter**, *otherwise*.

(*b*) Some interrogative particles such as **quomodo**, *in what manner?* **quam**, *how?*

(*c*) Particles of emphasis: **certe**, *certainly;* **scilicet**, *of course*, &c.

(*d*) Particles of negation: **non**, **ne**, *not*.

(*e*) Adverbs which are formed from adjectives. This is the largest class of adverbs, almost every adjective in Latin having an adverb corresponding to it. Adverbs may be formed from adjectives in the following ways:—

i. By adding *o* to the stem of adjectives of three terminations in *-us*, *-a*, *-um*—*e.g.*, *tut-o* (from *tutus*, *-a*, *-um*); *merit-o* (from *meritus*, *-a*, *-um*); *fals-o* (from *falsus*, *-a*, *-um*).

ii. By adding *ē* to the stem of adjectives of three terminations in *-us*, *-a*, *-um*—*e.g.*, *dign-ē* (from *dignus*, *-a*, *-um*); *miser-ē* (from *miser*, *-a*, *-um*); *vafrē* (from *vafer*, *vafra*, *vafrum*). In a few cases the *e* is short—*e.g.*, *malĕ* (from *malus*, *-a*, *-um*).

iii. By adding *-iter* or *-ter* to the stem of adjectives with consonant or *-i* stems, which are declined on the model of nouns of the third declension—*e.g.*, *forti-ter* (from *fortis*); *feroc-iter* (from *ferox*); *audac-iter* (from *audax*).

iv. The neuter singular of some adjectives is used as an adverb, especially by the poets—*e.g.*, *facilĕ* (from *facilis*); *dulcĕ* (from *dulcis*); *perfidum* (from *perfidus*), in the phrase **perfidum ridens**, *treacherously smiling*.

Adverbs derived from adjectives have a comparative and superlative form, as well as a positive. We give examples of the regular and irregular comparison of adverbs.

REGULAR.

Positive.	*Comparative.*	*Superlative.*
Tuto	tutiŭs	tutissimē.
Dignē	digniŭs	dignissimē.
Fortiter	fortiŭs	fortissimē.
Audaciter	audaciŭs	audacissimē.
Facilĕ	faciliŭs	facillimē.

IRREGULAR.

Positive.	*Comparative.*	*Superlative.*
Bĕnĕ	meliŭs	optimē.
Malĕ	pējŭs	pessimē.
Multum	plŭs	plurimum.
Magnopere	măgis	maximē.

2. Local Adverbs.

(*a*) Interrogative—*e.g.*, **ubi**, *where?* **quo**, *whither?* **quā**, *by which way?* **quatenus**, *how far?*

(*b*) Affirmative—*e.g.*, **hic**, *here*, **illic**, *there*, **hinc**, **inde**, *hence*, **illinc**, *thence*, **huc**, *hither*, **illuc**, *thither*, **hactenus**, *thus far*, &c.

3. Temporal Adverbs.

(*a*) Interrogative—*e.g.*, **quando**, **cum**, *when?* **quamdiu**, *how long?* **quousque**, *to what limit?* **quamdudum**, *how long ago?*

(*b*) Affirmative or negative—*e.g.*, **tum**, *then*, **unquam**, *ever*, **non**, *not*, **nunquam**, *never*, **jam**, *already*, **hodie**, *to-day*, **dehinc**, *henceforth*.

4. Numeral Adverbs: *e.g.*—

Semel, *once*, **bis**, *twice*, **ter**, *three times*, **quinquiens**, *five times*, **sextiens**, *six times*, &c. For a list of numeral adverbs, *see* lesson IV., Vol. I., p. 230.

We have already given you examples of the comparison of adverbs derived directly from adjectives. There are some adverbs which are not formed from adjectives, which still have degrees of comparison.

Below we give a list of them, which should be committed to memory.

Positive.	*Comparative.*	*Superlative.*
Intus, *within*	interiŭs	intimē.
Post, *after*	posteriŭs	postrēmō.
Prope, *nearly*	propiŭs	proximē.
Saepĕ, *often*	saepiŭs	saepissimē.
Diū, *long*	diutiŭs	diutissimē.
Satis, *enough*	satiŭs	
Nuper, *lately*		nuperrimē.

PREPOSITIONS.

The use of the prepositions is to help out the meanings of the case-endings. In inflected languages prepositions are not absolutely necessary to the structure of sentences, as they are in a language like English, which has rid itself of the majority of inflections. As a language grows out of its inflectional stage and becomes what Max Müller calls *analytical—i.e.*, discards inflections—prepositions become more and more useful. Some prepositions are used with the accusative case, some with the ablative, and some few with both. The relations generally expressed by prepositions are those of time and place. For the present we shall say no more of the use of prepositions. We shall return to the subject when in our lessons on Syntax we consider the uses of the ablative and accusative cases.

CONJUNCTIONS.

Conjunctions are words which connect words, phrases, or sentences. They may be divided into two main classes (1) *co-ordinative*, and (2) *subordinative*. The first class connect words or sentences without affecting the construction or building up of the sentences; the second class connect sentences, one of which depends upon the other, and which so undergoes a change in construction. Until you have learnt something of Latin syntax it is impossible that you should understand the subordinative conjunctions; for the present you must be content to know that such particles exist. A few words may be said here about the co-ordinative conjunctions, which present no difficulties, as they do not affect the construction of sentences in the slightest.

Co-ordinative conjunctions may be classed as follows:—

(*a*) Connective, which simply join words and phrases together—*e.g.*, **ĕt**, **atquĕ**, **-quĕ**, *and*, **quoque**, *also*, &c.

You must be careful to notice that *-que* is what is called an enclitic—that is to say, it cannot stand in front of the word which it couples to a previous word; it must always be tacked on it—*e.g.*, **arma virumque**, *arms and the man*. We can say **arma** *et* **virum**, but never **arma** *que* **virum**.

(*b*) Disjunctive, which disconnect two words or phrases. Such are **aut**, **vel**, **-ve**, **sive**, *or*. *-Ve* is an enclitic, and what we said about *-que* applies equally to this word.

(*c*) Adversative, which suggest the opposition of one clause or sentence to another. Such are **sed**, **at**, **verum**, **autem**, *but*, **tamen**, *nevertheless*.

(*d*) Illative.—This term, not a very lucid one, is applied by grammarians to those conjunctions which introduce an inference—*i.e.*, a statement which follows naturally from what has been said before. Such are **ergo**, **igitur**, *therefore*, **itaque**, *and so*, **propterea**, *on that account*.

(*e*) Causal.—The causal conjunctions are **nam**, **namque**, **enim**, all of which may be translated by the English *for*. It is noticeable that *enim* cannot come first in a sentence.

INTERJECTIONS.

Interjections are words interjected, as it were, into a sentence, the form and construction of which they do not in the slightest affect. The majority of them are nothing more than imitations of cries and shrieks, and they are used to express all sorts of emotions, such as surprise, sorrow, anger, disgust, laughter, &c.—*e.g.*, **a**, **ah**, **eia**, **o**, **io**, **eheu**, **vae**, **hahahae**, **taxtax** (imitating the sound of blows), **tarantara** (the sound of a trumpet). Some nouns, such as **malum**, *plague!* and **pax**, *hush!* are used as interjections, as well as many clipped words or phrases. Of the latter the majority are oaths—*e.g.*, **Ecastor**, which stands for **en Castor**, **Pol** for **Pollux**, **Mehercule** for **me Hercules juvet**, *so help me, Hercules!* and **medius fidius** for **me deus fidius juvet**, *so help me the God of faith!*

GENDER.

You have of course observed that all nouns in Latin have a distinctive gender, that inanimate objects may be masculine or feminine as well as neuter. This is quite different from our own language, and it presents a great difficulty to the student of Latin. There are a few general rules which, if you bear them in mind, will enable you to determine at once the gender of a large number of nouns.

1. Gender is never opposed to sex. That is to say, a noun which denotes a male is always masculine, a noun which denotes a female is always feminine. Many nouns may be either masculine or feminine, and these are called *common*. Such are **artifex**, *an artist*, **civis**, *a citizen*, **parens**, *a parent*, &c.

2. Nouns which are the names of *months*, *winds*, *mountains*, *rivers*, and *peoples* are masculine.

3. Nouns denoting *plants*, *countries*, *islands*, and *cities* are feminine.

4. Every noun which cannot be declined is neuter.

To the first and last of these general rules there are no exceptions. But there are a good many to the second and third. We shall not attempt here to give you a complete list of the exceptions; a few typical ones will be enough. The only satisfactory method of learning the gender of all Latin nouns is to carefully notice them when you meet with them in the course of your reading of Latin authors.

Exceptions to Rule 2:—

The following nouns denoting mountains and rivers are of the feminine gender: *Hybla*, *Aetna*, *Rhodope*, *Albula*, *Styx*. *Pelion*, *Gargara*, *Soracte*, and a few others, are neuter.

Exceptions to Rule 3:—

The following nouns denoting plants, countries, and cities, which we should expect to be feminine, are masculine: *acanthus*, *asparagus*, *narcissus*, *Pontus*, *Delphi*, *Gabii*, &c. A considerable number are neuter—*e.g.*, *papaver* (*poppy*), *piper* (*pepper*), *Latium*, *Samnium*, *Tusculum*, *Praeneste*, &c.

With certain limitations the gender of a noun may be determined by the declension to which it belongs.

Thus nouns of the *first declension*, unless, like *nauta* and *poeta*, they denote males, are of the feminine gender.

Nouns of the *second declension* ending in *-us* and *-er* are masculine, those in *-um* are neuter.

The following exceptions should be noted: *alvus* (*belly*), *Arctus* (the constellation called the *Bear*), *balanus* (*balsam*), *carbasus* (*linen*), *colus* (*distaff*), *humus* (*the ground*), and *vannus* (*winnowing fan*), with a few others, are feminine; while *pelagus* (*the sea*), *virus* (*poison*), and *vulgus* (*the people*), are neuter.

In the *third declension* we find nouns of all genders, and it is hardly possible to formulate any hard and fast laws with regard to them. The rules which we give are generally observed, it is true, but the exceptions to them are very numerous.

1. Nouns of the third declension are masculine when they end in *-ēn* and *-ĕn*, *-er*, *-ĕs*, *-ēs* (when the genitive increases), *-ōs*, *-ŏr*, and *-ō*. Constant exceptions to this rule are nouns in *-dō*, *-gō*, and *-iō*, which are feminine, and nouns in *-men*, which are neuter.

2. Nouns of the third declension are feminine when they end in *-ās* and *-ăs*, *-aus*, *-dō*, *-gō*, *-iō*, *-ĭs*, and *-ēs* (when the genitive does not increase), as well as the majority of nouns ending in *-s* preceded by another consonant.

3. Nouns of the third declension are neuter when they end in *-ă*, *-ăr*, *-c*, *-ĕ*, *-ĭ*, *-l*, *-men*, *-t*, *-ur*, and *-us*.

These three rules will be found useful to remember, but the list of exceptions to them is a long one, and we repeat that the best method of learning the genders of Latin nouns is to carefully observe the gender of each noun you meet with in your reading.

The nouns of the *fourth declension* are masculine if they end in *-us*, neuter if they end in *-u*. The only exceptions to this rule are the following nouns in *-us*, which are feminine: *acus* (*needle*), *domus* (*house*), *Idus* (pl. *Ides*), *manus* (*hand*), *penus* (*food*), *porticus* (*portico*), and *tribus* (*tribe*).

The nouns of the *fifth declension* are all feminine, except *dies*, which is either masculine or feminine in the singular, masculine in the plural, and *meridies*, which is masculine.

IRREGULAR NOUNS.

When you began your study of the Latin declensions we thought it better not to confuse you at the outset by giving you a list of irregularities. Now, however, that you are tolerably familiarised with Latin accidence, it will be as well for you to know what are the principal deviations from the general rules of the declensions.

First Declension.—In early Latin the genitive singular of the first declension ended in *-āī* or *-as*. Forms in *-āī* are found in inscriptions in the early writers, and sometimes, though rarely, in Vergil. The genitive singular in *as* survives in the one word **paterfamilias**, "*the father of a family.*" In like manner in early Latin the dative singular ended in *-āī* instead of *-ae*.

The ablative singular once ended in *-ād*, not *-a*. In inscriptions the forms *praedad* and *sententiad* are found, and Plautus, a writer of comedies, who flourished in the third century B.C., sometimes uses the ablative in *-ad*, sometimes that in *-a*.

The genitive plural sometimes terminates in *-um* instead of *-arum*. This is particularly the case with Greek names and with nouns which are compounds of *gigno* and *colo*, and end in *-gĕnă* and *-cŏlă*. Examples: *Dardanidum* for *Dardanidarum*, *Grajugenum* for *Grajugenarum*, *caelicolum* for *caelicolarum*.

In the dative and ablative plural of nouns ending in *-ĭă*, *-iis* is sometimes contracted to *-īs*. The most familiar instance of this contraction is *grātīs* for *grātĭīs*.

A few nouns have a dative and ablative plural in *-ābŭs* instead of *-īs*. Instances of these forms, together with an explanation of them, will be found in lesson I., Vol. I., p. 44.

Some Greek nouns belonging to this declension preserve the inflections belonging to the Greek language. Many of them have two forms, one Greek, the other Latin. For instance, *Circē*, the declension of which according to the rule of the Greek language we give below, has also a form *Circă*, which is declined precisely like *mensă*.

Nom.	Circ-**ē**	Aenē-**ās**	Atrīd-**ēs**.
Voc.	Circ-**ē**	Aenē-**ā**	Atrīd-**ē**.
Acc.	Circ-**ēn**	Aenē-**ān** (*or* **am**)	Atrīd-**ēn** (*or* **am**).
Gen.	Circ-**ēs** *or* Circ-**ae**	Aenē-**ae**	Atrīd-**ae**.
Dat.	Circ-**ae**	Aenē-**ae**	Atrīd-**ae**.
Abl.	Circ-**ē**	Aenē-**ā**	Atrīd-**ā**.

Second Declension.—The irregular forms in the second declension are not very numerous. A few have been noted in lesson II., Vol. I., p. 118. For the rest, in early Latin the ablative singular ended in *-od* instead of *-o*, and so resembles the ablative singular of the first declension. There is a form of the genitive plural in *-um* instead of *-ōrum*, just as we saw there was in the first declension. We meet with it particularly in nouns denoting weights and measures when combined with numerals—*e.g.*, *nummum*, *talentum*, *medimnum*, &c.; in numerals—*e.g.*, *ducentum*, *quaternum*, &c.; in a few names of peoples—*e.g.*, *Teucrum*, and in some other nouns in poetry—*e.g.*, *deum*, *divum*, *virum*, *socium*, &c.

A few Greek nouns belong to this declension, but the only Greek forms which they retain as a rule are the nominative in *ŏs* and the accusative in *on*. The other cases almost invariably follow the Latin usage, and very often the nominative and accusative do so as well. Thus we find *Epirus* and *Epirum* as well as *Epiros* and *Epiron*.

Third Declension.—The principal irregularities in the third declension are the accusative and ablative in *-im* and *-i* respectively, on which we remarked in lesson II., Vol. I., p. 120. These forms are only found in *-i* stems. The nouns which have an accusative in *-im* are for the most part Greek names of places, such as *Nĕăpŏlĭs* and *Phălărĭs*. Then the accusative of the following generally ends in *-im*, *puppis* (*stern*), *securis* (*axe*), *sitis* (*thirst*), and *vis* (*strength*), while the three last-mentioned nouns almost invariably have an ablative ending in *-i*. It should be noted that present participles, when used as participles, have an ablative in *-e*; when they are used as adjectives their ablative ends in *-i*—*e.g.*, **te veniente**, *on your arrival*, **cum amanti matre venit**, *he came with his loving mother*.

The Greek nouns which may be classified with the nouns of the third declension are very numerous, but they retain only a few of their proper Greek forms when transplanted into the Latin language.

Greek nouns in *-os*, *-o*, *-eus*, and *-ys* are declined as follows:—

	Hēros (*m.*), *a hero.*		Atrēus (*m.*).
	Sing.	*Plur.*	*Sing.*
Nom.	Herōs.	Herōēs.	Atrēus.
Voc.	Herōs.	Herōēs.	Atrēu.
Acc.	Herōem *or* herōă.	Herōăs.	Atrĕum, Atrĕă.
Gen.	Herōĭs.	Herōum.	Atreī, Atrĕŏs.
Dat.	Herōī.	Herōĭbŭs.	Atreō.
Abl.	Herōĕ.	Herōĭbŭs.	Atreō.

The student will notice that *Atreus* may be declined throughout as though it were an ordinary noun of the second declension.

	Dīdō (*f.*).	Tēthȳs (*m.*).
Nom.	Didō.	Tethȳs.
Voc.	Didō.	Tethȳ.
Acc.	Didō (rarely Didōn).	Tethym *or* Tethȳn.
Gen.	Didūs.	Tethȳĭs *or* Tethȳŏs.
Dat.	Didō.	Tethȳī *or* Tethȳī.
Abl.	Didō.	Tethȳĕ.

Greek nouns in *-ēs* and *-ĭs* take *-ēn* and *-ĭn* as well as *-em* and *-im* in the accusative singular, and some nouns in *-is* have an accusative plural in *-idas*—*e.g.*, *tigrĭdăs*, instead of the more regular *tigrēs*. The genitive singular of some Greek names in *-ēs* ends either in *-ī* or *-ĭs*—*e.g.*, *Socrătes*, gen. *Socratī* or *Socratĭs*.

Greek neuter nouns in *ma* have a genitive ending in *-mătĭs*, while their dative and ablative plural terminate in *-mătīs*—*e.g.*, *poēmă*, gen. *poēmătĭs*, dat. and abl. plur. *poēmătīs*.

For the rest in Greek nouns with consonant stems which are used in Latin, the most constant divergences from the Latin usage to be observed in their forms are the following:—The genitive singular ends in *-ŏs* as well as *-ĭs*, the accusative singular ends in *-ă* as well as *-em*, and the accusative plural ends in *-ăs* as well as *-ēs*.

We have but one other remark to make upon this subject. The early Latin poets Plautus and Terence, and the prose-writer Cicero, generally give Latin inflections to the Greek nouns which they use, whereas Propertius, Ovid, and the later poets almost always retain the Greek forms. Some other writers, among whom we may mention Vergil and Horace, follow no rule in this matter, but sometimes use the Latin forms, sometimes the Greek.

Fourth and Fifth Declensions.—The few irregularities which these declensions present will be found set forth in lesson III., Vol. I., p. 185, and we need add nothing to what is said there.

KEY TO TRANSLATION FROM OVID (p. 157).

What sea has not known, what land knows not Arion? He checked running streams with his song. Often the wolf, pursuing the lamb, was held back by his voice; often the lamb, fleeing from the hungry wolf, stood still; dogs and hares have often lain down under the shade of one tree, and the hind has stood close to her foe the lioness. And without strife has the chattering crow sat with the bird of Pallas; and the dove been united with the hawk. Cynthia is said to have often been as much amazed at thy strains, sweet-voiced Arion, as at her brother's! The name of Arion had filled the cities of Sicily, and the Italian shore had been held captive by the sounds of his lyre. Returning home from thence Arion went on ship-board,

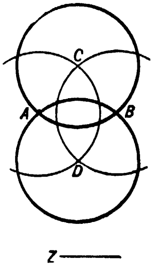
and bore with him the wealth he had gained by his art. Perchance, unhappy one, thou wert afraid of the winds and waves, but for thee the sea was safer than thy boat; for the pilot stood with drawn sword, and the rest of the crew (who were in the conspiracy) with armed hand. What hast thou to do with a sword? Steer thy wavering bark, O sailor! These are not the weapons thy fingers should hold. He, free from fear, said: "I do not deprecate death, but let it be allowed me to take my lyre and sing a few strains" They grant permission, and laugh at the delay. He takes his crown, which might grace thy locks, O Phoebus! He put on his cloak -twice dyed in Tyrian purple—and the string struck with his thumb gave forth its sounds. Then, thus attired, he leaps into the midst of the waves, and the dark prow is sprinkled with the water thrown against it. Then (what is beyond belief) they relate that a dolphin, with arched back, placed himself beneath this new burden. He (Arion) sits and holds his lyre, and sings as the price of his passage, and with his song calms the water of the sea. The gods behold deeds of piety; Jupiter receives the dolphin among the constellations, and bids him have nine stars.

GEOMETRY.—X.

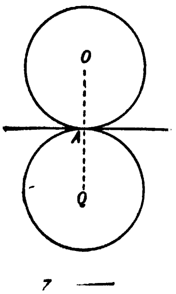
[*Continued from p. 163.*]

THE CIRCLE (*continued*).

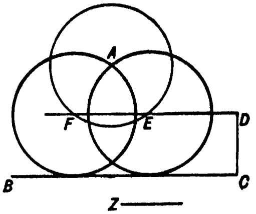
PROBLEM 116.—*To describe a circle having a given radius and passing through two given points.* Let A and B be the two given points, and Z the given radius. About A, with radius Z, describe a circle. The centre of any circle of radius Z, the circumference of which passes through A, is on this circle. The centre of the required circle is therefore on it. About B, with the same radius, describe another circle. The centre of the required circle is also somewhere on this circumference. Therefore, it is either the point C or the point D in which the two circumferences intersect. About C and D, with radius Z, describe circles, each of which fulfils the conditions of the problem.



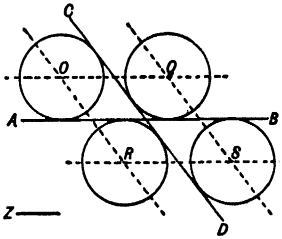
PROBLEM 117.—*To describe a circle having a given radius and touching a given straight line in a given point.* Let A be the given point in the given straight line, and Z the given radius. At A draw a straight line at right angles to the given one, and cut off from it on both sides of the latter lengths AO and AQ each equal to Z. About O and Q, with radius OA or QA—*i.e.*, equal to Z—describe two circles, each of which fulfils the conditions of the problem.



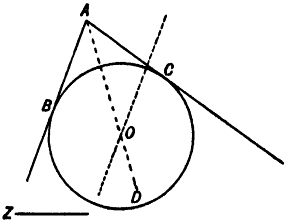
PROBLEM 118.—*To describe a circle having a given radius, and passing through a given point and touching a given straight line.* Let A be the given point, BC the given straight line, and Z the given radius. At any point C in BC draw a perpendicular, and from it cut off a length, CD, equal to Z. Through D draw a straight line, DEF, parallel to CB. FD is a course or *locus* (position) of points, about any one of which a circle described with radius Z will touch BC, and the centre of the required circle is therefore on FD. About A as centre, with radius Z, describe a circle. The circumference of this circle is the *locus* of points about any one of which, as centre, with radius Z, a circle being described, its circumference will pass through A. The centre of the required circle is, therefore. also on this circumference. Therefore, it is at E or F, the only points in which the said *loci* intersect. About E and F, with radius Z, describe circles, either of which is such as is required.



PROBLEM 119.—*To describe a circle having a given radius and touching each of two given straight lines.* Let AB and CD be the two given straight lines, and Z the given radius. At a distance from AB and CD equal to Z, and on either side, draw the two pairs of parallels OQ and RS, and OR and QS, intersecting in O, Q, R, and S. About these four points as centres, with radius Z, describe circles, each of which will meet the requirements of the problem.

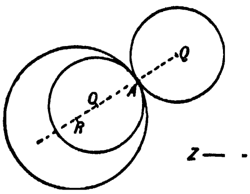


Let BA and CA be given straight lines which, produced if necessary, meet at a point A, and let Z be the given radius. Bisect the angle BAC by the straight line AD. The centre of one required circle is on AD. Draw a parallel to AB or AC at a distance equal to Z. The centre of the same circle is also on this line. Hence, O—the point in which the parallel and the bisector meet—is the centre, and a perpendicular from O to AB or AC the radius of the circle required. On



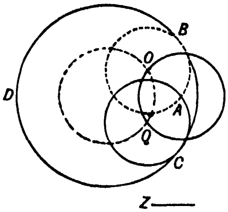
producing B A and C A through A, and repeating the process, the three other circles fulfilling the conditions of the problem will be obtained.

PROBLEM 120.—*To describe a circle with a given radius, touching a given circle at a given point on its circumference.* Let A be the given point on the circumference of a given circle, centre R, and let Z be the given radius. Draw a straight line through R and A, and from the inward and outward portions cut off A O and A Q each equal to Z. About O and Q with radius Z describe two circles, either of which fulfils the conditions of the problem, one touching the given circle internally and the other externally.



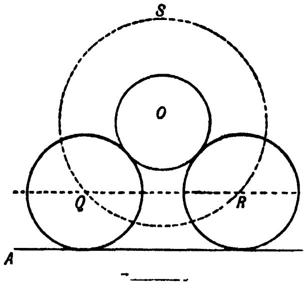
Circles which touch each other, whether internally or externally, have their centres in a straight line passing through their point of contact.

PROBLEM 121.—*To describe a circle, with a given radius, touching a given circle and having its circumference passing through a given point.* Let A be the given point, B C D the given circle, and Z the given radius. In this example, let A be within the circle B C D. Concentric with the circle B C D describe another circle, with radius equal to the difference of Z and the radius of the given circle. The centre of the required circle is at some point on this circumference. About A, also, with radius Z describe a circle. The centre of the required circle is also on this circumference. Therefore, it is at O or Q, a point of intersection of the first-mentioned circumference with the latter. About O and Q, with radius Z, describe circles, either of which fulfils the conditions of the problem.



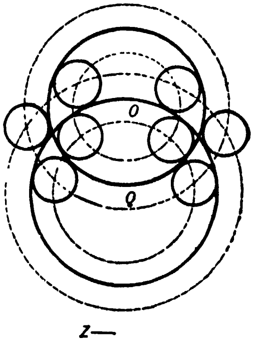
If A is without the given circle, the first of the said circumferences is obtained with a radius equal to the sum of Z, and the radius of the given circle, instead of the difference. The required circles are then external to the given circle.

PROBLEM 122.—*To describe a circle with a given radius, touching both a given circle and a given straight line.* Let the circle, the centre of which is O, be the given circle, A B the given straight line, and Z the given radius. Draw Q R parallel to A B at a distance, Z. The centre of any circle of radius Z, which touches A B on the same side as the given circle is situated, is on Q R. About O as centre, with radius equal to the sum of the radii of the given circle and the required circle (Z), describe another circle, Q R S. The centre of any circle, of radius Z, which touches the given circle, is on the circumference Q R S. Therefore it is either Q or R, the points in which the parallel and the last-mentioned circumference intersect. About Q and R, with radius Z, describe circles, either of which satisfies the requirements of the problem.



In some instances a greater number of results may be obtained. Thus, when the given circle lies across the given straight line, and other conditions are favourable, no less than eight circles can be described touching the given circle and the given straight line. The solution then requires two parallels to be drawn to the given line, one on each side of it; and two circles concentric with the given one are required to be drawn, one having a radius equal to the sum of Z and the radius of the given circle, and the other a radius equal to the difference.

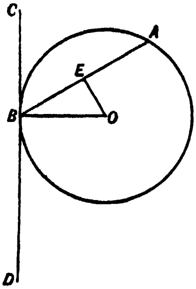
PROBLEM 123.—*To describe a circle with a given radius, touching each of two given circles.* Let the circles having the centres O and Q be the two given circles, and Z the given radius. About the centre O describe concentric circles, one having a radius equal to the sum of Z and the radius of the first given circle, and the other a radius equal to the difference. Similarly, about Q, describe concentric circles having radii increased and diminished from the radius of the second given circle by Z. The intersections of the said concentric circles, two and two, are the centres of the required circles.



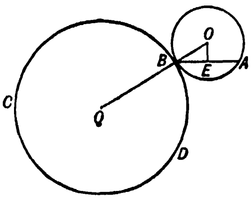
In the figure there are eight such points of intersection, and eight circles satisfying the conditions of the problem. This is the largest number possible. As a rule, the data are not favourable to the production of so large a number.

This problem is useful in producing a representation of wheels of given sizes gearing in with one another.

Problem 124.—*To describe a circle passing through a given point and touching a given straight line at a given point.* Let A be the given point through which the circle is to pass, and B the given point at which the circle is to touch C D, the given straight line. At B draw a perpendicular to C D. The centre of the required circle must be in this perpendicular. Join B A, bisect it in E, and at E draw a perpendicular to A B. The centre of the required circle is also in this perpendicular. Therefore, it is at O, the point in which the two perpendiculars intersect. About O, with the radius O B or O A, describe a circle, which is the circle required.

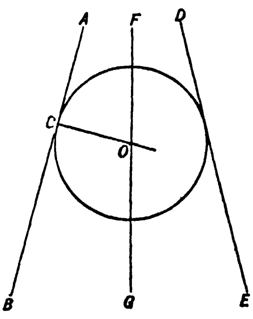


Problem 125.—*To describe a circle passing through a given point, and touching a given circle at a given point on the circumference.* Let A be the given point through which the required circle is to pass, and B the given point at which it is to touch the circumference of the given circle, B C D. Find the centre Q of the given circle. Join Q B, and produce it. The centre of the required circle is in this line. Join B A, bisect it in E, and at E draw a perpendicular to A B. The centre of the required circle is also in this perpendicular. Therefore it is at O, the point in which this perpendicular and the straight line through Q and B intersect. About O, with the radius O B or O A, describe a circle, which is the circle required.

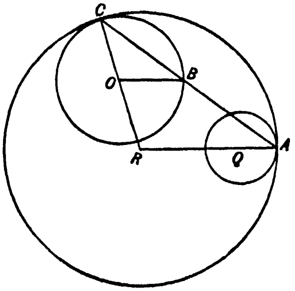


The given point A may be inside the given circle, as well as outside, and the same words and references still give and explain the construction.

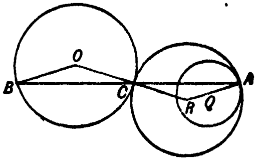
Problem 126.—*To describe a circle touching two given straight lines, and one of them at a given point.* Let A B, containing the point C, and D E be the two given straight lines. Draw the straight line F G, bisecting the angle between them; if they meet, or can be produced to meet, by Problem 7—if not, by Problem 12. The centre of the required circle is in this bisector. At C in A B draw a perpendicular to A B, cutting F G in O. The centre of the required circle is also on this perpendicular. Therefore, it is at O, the point of intersection of the perpendicular and the bisector. About O as centre, with the radius O C, describe a circle, which will touch D E as well as A B.



Problem 127.—*Given two circles and a point on the circumference of one of them, to describe another circle touching the given ones and the one of them at the given point.* Let the two given circles be those having the centres O and Q, and let A on the circumference of the latter be the given point. Join A Q. Draw the radius O B parallel to Q A. Join A B, and let A B, produced if necessary, meet the circumference of the former circle again in C. Join C O, and produce it, if necessary, to meet A Q, also produced if necessary, in R. R is the centre, and R A or R C the radius, of the circle required.

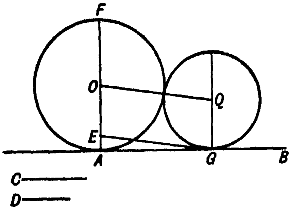


The two given circles may be situated relatively to each other in a variety of ways. If the angle Q A B when it is formed happens to be a right angle, A B is a common tangent to the two given circles, the points B and C merging into the one point B, and the radii O B and O C into one radius, the radius perpendicular to A B. In this extreme case, A Q and C O (now B O) will not meet to give a centre R.

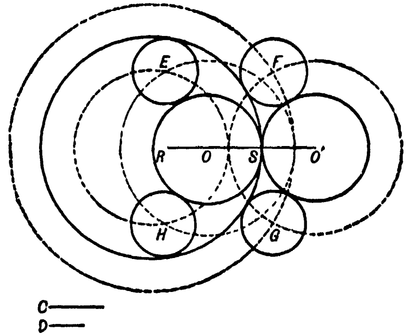


In the figure just given both given circles are in contact with the resulting circle on the inside of its circumference. In some cases contact is on the outside, instead of the inside; and in others, one of the given circles is in contact on the inside and the other on the outside. If B O, the parallel to A Q, is drawn from O in the opposite direction, as now shown, the resulting circle is seen to include one given circle and exclude the other.

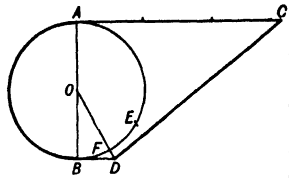
Problem 128.—*To describe two circles, of given radii, touching each other and also a given straight line.* Let A B be the given straight line, and C and D the lengths of the radii of the required circles. At any point A in A B draw a perpendicular, and from it cut off A O and O F each equal to C; and proceeding from O downwards, cut off O E equal to D. About E as centre, with the radius E F, cut A B in G. Let a straight line, drawn from O parallel to E G, meet, in the point Q, the perpendicular to A B at G. Circles about O and Q, with the respective radii C and D, are the two circles required.



PROBLEM 129.—*To describe two circles, of given radii, touching each other and also a given circle.* Let the circle with centre R be the given circle, and let C and D be the lengths of the radii of the required circles. Draw any radius R S of the given circle, and produce it. From S R cut off S O equal to C; and from R S produced cut off S O′ also equal to C. About O and O′ as centres, with radius equal to C, describe circles, one touching the given circle internally and the other externally. Describe two circles concentric with the given one, the larger having a radius greater than the radius of the given circle by D, and the smaller having a radius less than the radius of the given circle also by D. The centre of any circle with radius D, and touching the given circle, must have its centre on one or other of these two concentric circles. Concentric with each of the circles whose centres are O and O′, draw another circle having a radius greater than that of these circles again by D. The centre of any circle with radius D, and touching either of the circles having the centres O and O′, must be on one of the last drawn circles. Hence, E, F, G, and H, the points of intersection of the concentrics round O and O′, with the concentrics round R, are the centres about which the circles required may be described.

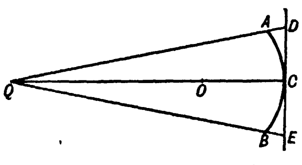


PROBLEM 130.—*To find approximately the length of the semi-circumference of a given circle.* Let A B E be the given circle. Find the centre O, and through O draw any diameter A B. At A and B draw straight lines at right angles to A B. From the former of these perpendiculars cut off A C equal to three times the radius. From B, on the same side of A B, with the same radius, cut off from the circumference of the circle an arc B E equal to one-sixth part of the circumference; bisect this arc in F, join O F, and produce it to meet the latter perpendicular in D. Join D C, which is approximately the length of the semicircle, as required.



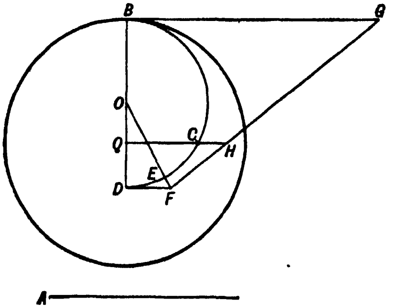
If the radius of any circle be called unity, the hypothenuse of a right-angled triangle, whose sides are as 2 and $(3-\sqrt{\frac{1}{3}})$, is within one-fifty-thousandth part of the true length of the semi-circumference (3·141592654 times the radius)—say, about an inch of error to a mile of curve. The true rectification (making straight) of a circular curve underlies a problem which was much attempted by the old mathematicians, and which was generally known as "squaring the circle." The ratio of the circumference to the diameter, or the semi-circumference to the radius, cannot be expressed either by a line geometrically or in figures numerically; but it may be approximated to with an extremely near approach to accuracy. In figures, the ratio has been calculated to three or four hundred places of decimals, but no useful purpose can be served by repeating them all. The few given above are more than twice as many as are sufficient for every ordinary want.

PROBLEM 131.—*To find approximately the length of a small circular arc.* Let A B be the given circular arc. Bisect the arc A B in C, and at C draw the line of tangent, D E. Find the centre, O, of the circle, join C O, and from C O produced cut off C Q three times the length of C O. Draw straight lines from Q through A and B, meeting D E in D and E. D E is approximately the length of the arc, as required.



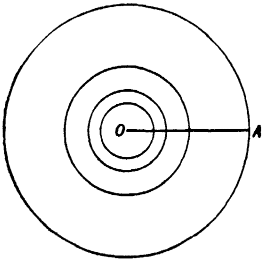
This solution is simple in construction, and at the same time gives a close approximation to the truth—two manifest advantages. If the arc does not exceed a ninth part of a semicircle (20°), the error does not exceed about one two-hundred-thousandth part of the true length, and gets still less as the arc diminishes. If the arc should exceed the sixth part of a semicircle (30°), it should be subdivided; and the length of each portion having been found by the present method, the sum of the lengths so found will give very approximately the total length of the whole arc.

PROBLEM 132.—*Given the length of the circumference of a circle, to describe the circle.* Let A be the length of a quadrant which, to save space, we give instead of the complete circumference.



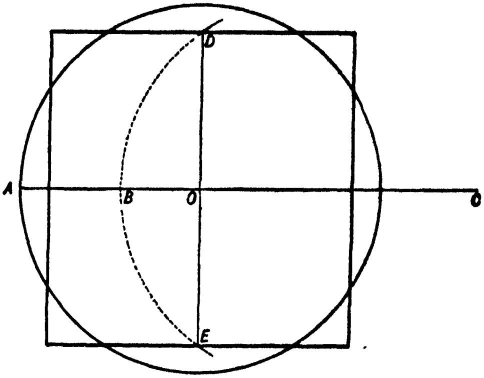
About any point O, in any straight line, with any radius, describe a semicircle B C D. With the same radius cut off the arc D C, and bisect this arc in E; join O E, and produce O E to meet the perpendicular to B D at D, in F. If along a perpendicular to B D at B, a length B G be taken equal to thrice the radius, and G be joined to F, we have, as previously shown, F G, the length of the semi-circumference of the circle, whose radius is any assumed radius, O B or O D. From G F cut off G H equal to A, and draw H Q parallel to G B or F D, and meeting B D, or B D produced, in Q. About Q, with radius Q B, describe the circle required.

PROBLEM 133.—*To describe a circle the circumference of which shall be equal to the sum of the circumferences of two or more given circles.* Let the three inner circles, with centre O, be the given circles. From O draw any straight line, and cut off in succession portions respectively equal to the radii of the given circles, so that O A, the whole line so cut off, is equal to the sum of these radii. About O as centre, with the radius O A, describe the circle required.



The circumference of any circle bears a fixed or constant ratio to the radius.

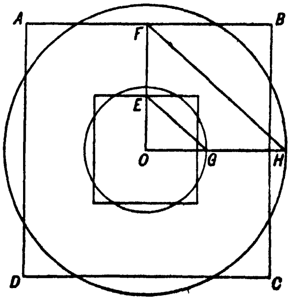
PROBLEM 134.—*To describe a square the area of which shall be (approximately) equal to the area of a given circle.* Let the circle with centre O be the given circle. Draw any radius O A, and bisect it in cut off O C equal in length to a quadrantal arc (Problem 130). On B C as diameter describe a circular arc cutting the perpendicular to A C



through O in the points D and E. The square, with centre O, and two opposite sides passing through D and E, parallel to B C, is the square required.

D O is a mean proportional between the half radius O B and the length O C of the quadrant, or D E, between the whole radius and the semicircle. If O C be determined by Problem 130, the area of the square is within one-fifty-thousandth part of the exact area of the circle.

PROBLEM 135.—*To describe a circle (approximately) equal in area to a given square.* Let A B C D be the given square. Find the centre O. About O as centre describe any circle at random. Find a square equal to it by the previous problem, its sides being parallel to those of the given square. From O draw two straight lines at right angles to adjacent sides of the squares, one intersecting a side of the found square in E and a side A B of the given square in F, the other intersecting



the circle in G. From F draw a parallel to E G, meeting O G, or O G produced, in H. O H is the

GEOLOGY.—I.

INTRODUCTORY—THE METHODS OF GEOLOGICAL INQUIRY—THE DIVISIONS OF THE SUBJECT.

GEOLOGY (Greek *γῆ*, *gē*, the earth; *λόγος*, *lŏgŏs*, word) is the science of the composition, structure, and physical history of the earth. The study of this comprehensive subject by scientific methods is of very recent date, belonging almost entirely to the present century; and though an immense accumulation of facts and logical inferences have already been collected, very much yet remains to be learnt. In former times many speculative guesses were made at the causes of some of the appearances presented by the rocks forming the earth's surface, the fossils they contain, the mountain-chains into which they are elevated, or the earthquakes and volcanoes by which they are disturbed. These guesses were, however, but little supported by any systematic appeal to facts.

Geological Method.—Modern geology recognises that it is illogical to imagine unknown causes to have operated in the past until we have exhausted the possibilities of those which we see still in action around us. It has, therefore, for its chief principle that known, from its populariser, Sir Charles Lyell, as "the Lyellian maxim," that, in the main at least, the causes in operation in the past were the same in kind and even largely in degree as those now in action; for instance, the action of rain and rivers (Fig. 1). Geology is thus pre-eminently a science of observation, based upon observations on the rocky structure of the earth, which find their chief interpretation and which have their past history unravelled by observation of the facts of Physical Geography. Whilst, therefore, Physical Geography is, as has been pointed out (Vol. I., p. 60), in some respects the last chapter of geology, it may, as the foundation of geological reasoning, be regarded as the first in order of study. The facts we observe will very probably lead us to various more or less hypothetical explanations; but all geologists, and especially beginners in the study, should remember that theirs is a science in which, more than in some other sciences, it is imperatively necessary to test every hypothesis by its agreement with ascertained facts. Dr. Archibald Geikie writes: "The facts with which it deals should, as far as possible, be verified by our own personal examination. We should lose no opportunity of seeing with our own eyes the actual progress of the changes which it investigates, and the proofs which it adduces of similar changes in the far past. To do this will lead us into the fields and hills, to the banks of rivers and lakes, and to the shores of the sea. We can hardly take any country walk, indeed, in which with duly observant eye we may not detect either some geological operation in actual progress, or the evidence of one which has now been completed. Having learnt what to look for, and how to interpret it when seen, we are, as it were, gifted with a new sense. Every landscape comes to possess a fresh interest and charm, for we carry about with us everywhere an added power of enjoyment, whether the scenery has long been familiar or presents itself for the first time."

To aid him in his investigations, the geologist borrows largely from chemistry, mineralogy, botany, zoology, physics, and even mathematics and astronomy; but though such a statement seems calculated to alarm the student, much of the science can be understood with a very elementary acquaintance with these other subjects. With little apparatus beyond his hammer, the young geologist, never passing a quarry or a stone-heap unexamined, may not only acquire knowledge for himself, but may soon add to the general stock of geological information.

Experiment.—Nor is simple observation the sole, though it is the chief, method of geological inquiry. There is also occasion for experiment. During the comparatively limited time for which we can keep natural processes under observation, their operation may well be slight; the moderate temperature and pressure under which chemical changes commonly occur at the earth's surface present little analogy to the conditions at a greater depth. Laboratory experiments under artificial conditions may therefore throw considerable light on the operations of nature.

The methods of research of the geologist and the various branches of his inquiries have been often compared to those of the historian and of the student of architecture. The historian may have to decipher chronicles in a language the very alphabet and grammar of which has first to be determined. These chronicles may have been imperfectly kept at the time, and those only may be obtainable referring to a small portion of the territory of an extinct race. Of these the early volumes may be lost, and of those remaining many whole pages may have been entirely obliterated, and many lines, words, or letters even in those which are most perfect. So in "the great stone book of Nature" the language must be interpreted by comparison with changes now in progress. The crystal as it forms in the slowly-cooling glass of a volcanic lava, the rain-drop in the wet sand, the track left in the muddy bottom by the feet of a crab, the structure of every existing plant and animal, each contribute to the vast alphabet in which she writes her "sermons in stones." As the linguist may study comparative grammar from ancient inscriptions, so the chemist may form compounds in his laboratory by processes similar to those by which they have originated among natural minerals, or the comparative anatomist may reconstruct from a few bones or teeth the skeletons of a whole series of fossil animals. The oldest rocks, however, which the geologist can examine tell him little or nothing as to the origin of the earth, but point rather to the former existence of other still earlier rocks now for ever destroyed; and those that remain never contained more than a most partial representation of the life or other conditions of the period in which they were formed. We may trace the lava-flow to the stump of the extinct volcano; we may find the roots and stems of the larger plants in the coal formed by an ancient sunderbund, the bed of oysters in the former estuary, or even the delicate wings of insects in the fine sediment of a lake or in the amber exuded by the fir-trees of the past, not to speak of the more abundant remains of marine life. The perishable algæ, fungi, and mosses, however, which probably existed during the same periods of the earth's history, the birds of the air, and many of the plants and animals of the dry land over which no sediment was accumulating, will have left few or no traces of their being. The rocks which may contain many fossils still unknown have as yet in many parts of the world not been searched; and wherever we do examine them we find abundant evidence of much destruction having taken place. The waves of the sea or the action of frost and rain have reduced many rocks and their contained fossils to powder; percolating water may have dissolved the calcareous shells out of a sandstone; or crystallization, produced either by the crumpling of the rocks under intense pressure, or by contact with molten lava, may have entirely obliterated fossils that the rocks once contained. This will afford some idea of what is meant by *the imperfection of the geological record.*

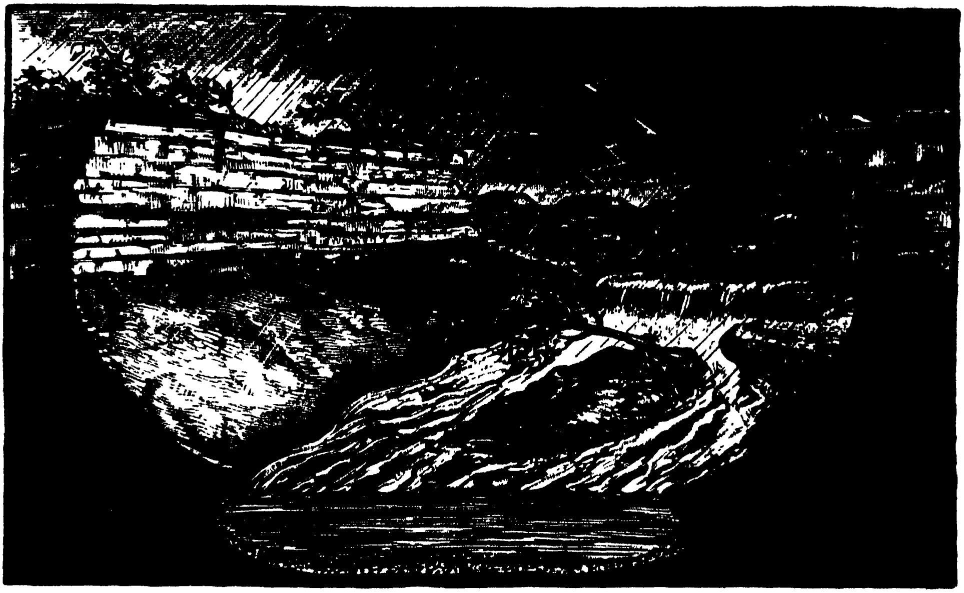


Fig. 1.—Subaërial Denudation, or the Action of Rain and Rivers.

Again, a student of architecture examining some historic building may do so from several points of view. He may examine the materials used in its construction, tracing the quarries whence they were dug, and the forests where the trees were probably felled. He may look at the building as an engineer, investigating the way in which these materials have been used: how the stones, beams, or girders have been raised, and the way in which they have withstood the hand of Time. From a more purely architectural standpoint he may see how the materials are massed, the bricks bonded, and the style of the mouldings, pillars, arches, etc.; and lastly, from these investigations he may show that the building has been the work of many ages, that it has been often partially destroyed and rebuilt in differing styles, and that it reveals much of the history, social habits, religion, and general life of the times in which it was constructed.

Divisions of the Subject.—So the study of the earth by the geologist may be conveniently divided into four departments, Petrography, Dynamical Geology, Geotectonic, and Historical Geology. *Petrography* (Greek **πέτρος**, *pĕtrŏs*, a rock; **γραφὴ**, *grăphē*, description) deals with the rocks of which the earth is composed from the point of view of their mineral constitution, which is mainly investigated either by chemical analysis, or by the examination of transparent slices under the micro-polariscope. This department endeavours to elucidate the formation of rocks from hand-specimens, and is not immediately concerned with their occurrence in mass. Mineralogy is practically a sub-division of Petrography; but, of the many hundred kinds of minerals known, the geologist is chiefly concerned with a far smaller number, viz.: (i.) the *rock-forming minerals*—*i.e.*, those that constitute the *essential* or more commonly occurring *accessory* ingredients of rocks; (ii.) the *metalliferous ores;* and (iii.) the *veinstones*, or non-metalliferous minerals commonly associated with them. *Dynamical Geology* (Greek **δυναμικὸς**, *dunămĭkŏs*, effective) deals with the agencies which have produced the existing rocks, and are now modifying rocks previously formed, and forming new ones. Most of these agencies have already been touched upon in our lessons in Physical Geography; and as it is equally easy to begin the study of Geology with either of its three first departments, it will be most convenient in the present series of lessons to begin by supplementing those lessons by more detailed reference to the action of the agencies in the past, and on the rocks, before passing on to rock-forming minerals and rocks. Among these agencies a large class are external to the earth itself. Such are the attractive influences of the sun and moon, producing the variations of seasons and tides. We shall not dwell in an elementary course like the present upon this branch of the subject, sometimes termed *Cosmical Geology* (Greek **κοσμικὸς**, *kŏsmĭkŏs*, relating to the universe), which includes various mathematical and hypothetical topics, such as the causes of climatic variations in past times, the Nebular hypothesis (*see* pp. 39 and 174), the tidal retardation and probable age of the earth.

There is also another large class of agencies that is sometimes treated as a distinct department of the science: viz., those dependent on the plants and animals of the past. Whole beds of rock, many feet in thickness, such as many limestones, coal, and others, are entirely composed of the remains of animals or plants. In addition to this, and to several important modes of action in disintegrating, or, in other cases, protecting, the soil, the fossil remains of once-living beings, when they occur scattered through other rocks, are of the utmost importance in enabling us to determine the climatic and other conditions under which these rocks were formed, and even their order of succession. The study of these plants and animals of the past is, strictly speaking, only a part of Botany and Zoology; but, as many of them belong to types now altogether lost, and still more as, owing to their very partial preservation, methods of study very different from those employed in the case of living organisms are made use of in examining them, the investigation of them is given the distinct name of *Palæontology* (Greek **παλαιὰ**, *pălăĭa*, ancient; **ὄντα**, *ŏnta*, beings). This study is divided into Palæobotany and Palæozoology.

Geotectonic (Greek **γῆ**, *gē*, the earth; **τεκτονικὸς**, *tĕktŏnĭkŏs*, relating to building), the architecture of the earth, deals with the modes of occurrence of rock-masses, how they rest on one another, how they have been folded, broken, compressed, and otherwise altered.

Lastly, from the study of all these departments—the materials of the earth, their arrangement, and the agencies by which this has been effected—*Historical Geology* endeavours to reconstruct the physical history of the earth and its inhabitants. Speculations as to the origin of the world are termed *Cosmogony* (Greek **κοσμογονία**, *kŏsmŏgŏnĭa*, the origin of the world); but, apart from these speculations, historical geology endeavours from observed facts to trace the physical geography of each successive period in the earth's existence; to mark out the continents and oceans, the mountain-chains and river-valleys, of each past age; to discover the prevalent climate of each part of the earth's surface; and to trace its influence in the distribution of the plants and animals that succeeded one another in the various epochs. This is the crowning aim of the never-to-be-completed task of the geologist.

BOOK-KEEPING.—II.

(Continued from p. 188.)

PERSONAL ACCOUNTS AND PROPERTY ACCOUNTS (*continued*).

Jany. 10.—Lent £150 to Charles Cooper, paying him the amount by means of a cheque on the Bank of England.

The cheque is a slip of paper (usually a prepared form) on which Wm. Wykeham instructs the bank to pay Chas. Cooper £150, Wykeham signing his name at the bottom of the form. A cheque, therefore, is not in itself a special kind of property, but merely an order to transfer property, *i.e.*, cash.

The effect of this cheque is to transfer £150 of the business cash to Charles Cooper. We have, therefore, to debit Cooper's account and credit the Bank account, *i.e.*, the account for business cash lodged at the bank.

Loan transactions are conveniently recorded in special accounts called loan accounts. If Cooper became a customer of the business, as well as a borrower of money, two accounts would be opened for him—one for the trading transactions, and the other, as shown above, for the loan transactions. The advantage of the separation consists in its recognition of the different conditions under which the two kinds of transactions occur. The one set are not chargeable with interest, the others are; and while in the former case the debts are payable within the short period of credit usually allowed in the trade, in the latter they are generally payable at dates more or less remote.

Jan^{y} 11.—*Received from Charles Cooper his cheque, drawn on the London and Westminster Bank, for* £20, *in part repayment of the sum lent to him, and paid the same into the Bank of England for collection of the cash.*

Here the property transferred is cash—Cooper's cash. The transferrer is Charles Cooper, and the transferree the business, represented in this case by the Bank of England cash account. We have accordingly to debit the Bank of England cash account and credit Cooper's.

Jan^{y} 12.—*Sold to Benjamin Brown a further quantity of wine at cost price, for which he owes* . . . . £75 : – : –

Debit Brown's account again and credit the wine account.

Jan^{y} 14.—*Received from Benjamin Brown a bill of exchange in settlement* . . £75 : – : –

Brown bought wine of the business on the 12th of the month, and did not pay for it. His account was thereupon debited. The claim which the business has since had against him is called a "book debt," a term signifying a debt for which there is no security for payment beyond the entry in the books of the business to the debit of his account. Things, however, are no longer to be left in this way. Brown is required by the business, in accordance with a very general custom of trade, to give a bill or written undertaking to pay the debt on a certain day. The bill in no way removes the indebtedness of Brown to the business, but it materially alters the conditions under which the debt is continued, and the relative position of the two parties concerned in it. Brown, on his part, is relieved from all obligation to discharge the debt during the currency of the bill—*i.e.*, until the day for paying it arrives. The business, on the other side, can take the bill to its bankers or elsewhere and discount it—*i.e.*, obtain the cash for it, less a small deduction by way of interest. Hence bills are a species of property, and are usually, though not invariably or necessarily, treated as property in book-keeping. Bills are of two opposite kinds—those for which the business has to receive the money, and those for which it has to pay. It is the practice to keep an account specially for the former class called the Bills Receivable account, and another and separate account for the latter called the Bills Payable account.

Reverting to the transfer mentioned in the item now under consideration, we say the property transferred is a bill, the transferrer being Brown, and the transferree the business. We have therefore to debit the business account, in this case the Bills Receivable account, and credit Brown's account.

Jan^{y} 15.—*Bought of Alex^{r} Arrowsmith a further quantity of wine, paying him for it half by cheque and half by bill* . . £220 : – : –

Debit the business—*i.e.*, the wine account—with the wine transferred, and credit Arrowsmith; then debit Arrowsmith with Bank Cash, £110, and Bill Payable, £110; and credit the business, viz., £110 to the Bank Cash account, and £110 to the Bills Payable account. There are no less than three things transferred in this case, and the transaction, therefore, represents a triple transfer.

Jan^{y} 16.—*Bought a building of John Ridges, to be used as offices for the business* £250 : – : –
And paid him by cheque the first of five instalments of the purchase-money . . £50 : – : –

Here two things are transferred—firstly, the premises, requiring us to debit the business (in this case the Premises account), and to credit Ridges with £250; secondly, cash, requiring us to debit Ridges, and credit the Bank Cash account with £50.

Jan^{y} 17.—*Brown's bill, falling due to-day, is handed to the Bank, who collect the cash from Brown* . . . . £75 : – : –

Here we might say is a double transfer. Cash is transferred from Brown to the business, or rather to the bank in behalf of the business, and the bill is transferred from the business to Brown. In theory, then, we might debit Bank cash, and credit Brown with the cash transferred, and debit Brown and credit the Bills Receivable account with the bill; but there is nothing whatever to be gained by debiting and crediting Brown on his duly paying a bill with which he has been previously credited; and the two theoretical entries to his account—*i.e.*, the equal debit and credit of £75—are in practice omitted.

Contractions or omissions of the kind now indicated are very frequent in book-keeping.

Jany. 18.—*Bought* £400 *of the Two-and-a-Half per Cents @* £92⅝, *brokerage* ⅛, *and paid by cheque* . . . . . £370 : - : -

The "two-and-a-half" stock, as it is called, requires a word of explanation. During the last century or century and a half the British Government has borrowed large sums of money which it has not yet repaid. For these sums, whatever their actual amount may have been, the assumed indebtedness at the present time is about £700,000,000. Hitherto this debt has been classified and known as Consols (a contracted form of Consolidated Stocks—*i.e.*, amalgamated or united stocks), Reduced Threes, and New Threes, and it has borne interest at the rate of three per cent. per annum, payable half-yearly. In addition to the stocks now mentioned, and which have formed nearly the whole of the debt, there has existed a comparatively small amount of stock on which interest was payable quarterly at the rate of 2½ per cent. only, and this is the stock now referred to. There has also existed a small amount of temporary, as distinguished from permanent or funded, debt; but we need not now consider the temporary debt, which is comparatively unimportant. By Mr. Goschen's scheme for converting the funded debt from 3 per cent. stocks into a 2½ per cent. stock, the old names—Consols, Reduced Threes and New Threes—and the old rate of interest, will gradually disappear, and the National Debt will become a stock on which interest at the rate of 2½ per cent. is payable; and it will accordingly be known as British Two-and-a-Half per Cent. Stock. The conversion scheme allows 2¾ per cent. until the year 1903, and thenceforth 2½ per cent. until the debt is paid off, or until new arrangements may be found to be possible. When completely in force, the scheme will save the country over three millions a year in interest; and even in its transition state the saving is one-half as much, about a million and a half.

The Government is under no obligation to pay off its funded debt; its obligation is limited to paying the interest regularly. Accordingly it happens that when a person who has lent the Government money wishes to realise his stock—*i.e.*, turn it into cash, he must find some other person who is willing to purchase his claim against the Government and take his position. The object of a Stock Exchange is to bring the buyers and sellers of financial stocks together. Purchases and sales of stock are usually effected through brokers, who charge in the case of British Government Stocks one-eighth per cent.—*i.e.*, half-a-crown per hundred pounds of stocks, for their trouble.

In the instance before us, the business finds a man who has a claim against the Government for £400. In order to get cash he is willing to take less than the full £400, namely, £369 : 10 : 0. The business accordingly hands the broker this sum to be paid over to the seller of the stock, and, in addition, it pays the broker 10s. for himself, as his commission or brokerage. The cost of the stock to the business is, therefore, £370.

The property transferred is, firstly, stock; secondly, bank cash. Stock carries a charge upon the future taxes of the country; and, although of the nature of a debt owing, is regarded as property, and so treated in book-keeping. Consequently we have to debit an account for "2½ per cents," and credit bank cash. The name of the seller is not introduced into the books, and indeed, at the time of the purchase, is often not known to the purchaser.

CASH.

1889.		£	s.	d.	1889		£	s.	d.
Jan. 1	Wm. Wykeham, Senr. - -	1,000	-	-	Jan. 3	Alexr. Arrowsmith - -	250	-	-
,, 7	Benjn Brown - - -	100	-	-	,, 4	,, ,, - -	200	-	-
,, 8	,, ,, - - -	50	-	-	,, 9	Bank of England - -	650	-	-
					,, 18	Balance, carried forward -	50	-	-
		1,150	-	-			1,150	-	-
Jan. 19	Balance, brought forward -	50	-	-					

CASH AT BANK OF ENGLAND.

1889.		£	s.	d.	1889.		£	s.	a.
Jan. 9	Cash	650	–	–	Jan. 10	Chas. Cooper	150	–	–
„ 11	Chas. Cooper	20	–	–	„ 15	Alexr. Arrowsmith	110	–	–
„ 17	Bill receivable	75	–	–	„ 16	Jno. Ridges	50	–	–
					„ 18	Two-and-a-half per cents.	370	–	–
					„ „	Balance, carried forward	65	–	–
		745	–	–			745	–	–
Jan. 19	Balance, brought forward	65	–	–					

BILLS RECEIVABLE.

1889.		£	s.	d.	1889.		£	s.	d.
Jan. 14	Benjn. Brown	75	–	–	Jan. 17	Cash	75	–	–

BILLS PAYABLE.

1889		£	s	d.	1889.		£	s.	d.
Jan 18	Balance, carried forward	110	–	–	Jan. 15	Alexr. Arrowsmith	110	–	–
					Jan. 19	Balance, brought forward	110	–	–

WINE.

1889.		£	s.	d.	1889.		£	s.	d.
Jan. 2	Alexr. Arrowsmith	250	–	–	Jan. 5	Benjn. Brown	100	–	–
„ 4	„ „	200	–	–	„ 8	„ „	50	–	–
„ 15	„ „	220	–	–	„ 12	„ „	75	–	–
					„ 18	Balance, carried forward	445	–	–
		670	–	–			670	–	–
Jan. 19	Balance, brought forward	445	–	–					

PREMISES.

1889.		£	s.	d.	1889.		£	s.	d.
Jan. 16	John Ridges	250	–	–	Jan. 18	Balance, carried forward	250	–	–
Jan. 19	Balance, brought forward	250	–	–					

TWO-AND-A-HALF PER CENTS.

1889.		£	s.	d.	1889.		£	s.	d.
Jan. 18	Cash	370	–	–	Jan. 18	Balance, carried forward	370	–	–
Jan. 19	Balance, brought forward	370	–	–					

WM. WYKEHAM, SENIOR.

1889.		£	s	d	1889.		£	s.	d.
Jan. 18	Balance, carried forward -	1,000	-	-	Jan 1	Cash - - - - - -	1,000	-	-
					Jan 19	Balance, brought forward -	1,000	-	-

ALEXANDER ARROWSMITH.

1889		£	s	d	1889		£	s	d
Jan 3	Cash - -	250	-	-	Jan 2	Wine - - - - - -	250	-	-
„ 4	„ - - -	200	-	-	„ 4	„ - - - - - -	200	-	-
„ 15	„ - - - - - - -	110	-	-	„ 15	„ - - - - - - -	220	-	-
„ „	Bill payable - - -	110	-	-					
		670	-	-			670	-	-

BENJAMIN BROWN

1889		£	s	d	1889		£	s.	d
Jan 5	Wine - - - - -	100	-	-	Jan 7	Cash - - - - -	100	-	-
„ 8	„ - - - - - -	50	-	-	„ 8	„ - -	50	-	-
„ 12	„ - - - - - - -	75	-	-	„ 14	Bill - - - -	75	-	-
		225	-	-			225	-	-

CHARLES COOPER (LOAN)

1889		£	s	d	1889		£	s	d
Jan 10	Cash - - - - -	150	-	-	Jan 11	Cash - - - - - - -	20	-	-
					„ 18	Balance, carried forward -	130	-	-
		150	-	-			150	-	-
Jan. 19	Balance, brought forward -	130	-	-					

JOHN RIDGES

1880.		£	s	d	1889.		£	s	d.
Jan. 16	Cash - - - - -	50	-	-	Jan 16	Premises - - - - -	250	-	-
„ 18	Balance, carried forward -	200	-	-					
		250	-	-			250	-	-
					Jan 19	Balance, brought forward -	200	-	-

If, on the evening of the 18th of January, it is desired to ascertain the position of affairs, the accounts are all closed or "balanced off." This is done in each case by finding the difference between the totals of the debit and credit entries, and entering this difference (if any) described as a balance, on the smaller side. The two sides now add up or "cast" to the same total figure. It is the practice to rule a double line under each of those equal totals, to show that the account is closed to that point. Care must be taken to re-write the balance below the double lines, so that it may not be lost sight of. It necessarily appears on the side of the account opposite to that on which it is first written; thus if the debit entries of an account are in excess of the credit entries, the balance is an excess of debits, which is first written on the credit side of the account to equalise the two sides, and then brought down and re-written on the debit side, to which side it really belongs

A BALANCE SHEET, or sheet or statement of balances, is a formal setting out of the balances remaining on the various accounts at any specified date. The form of balance sheet is divided vertically into halves, like that of any other account. On the first side are usually placed the credit balances, which will be seen at a glance to represent the liabilities of the business; and on the other side the debit balances, which represent the assets—*i.e.*, the various things that may be set against the liabilities. Thus, from the accounts given above we obtain the following

BALANCE SHEET

FOR THE 18TH OF JANUARY, 1889.

(Liabilities)

	£	*s.*	*d*		£	*s.*	*d.*
John Ridges	200	-	-	Charles Cooper (Loan)	130	-	-
Wm Wykeham, Senr	1,000	-	-	Two-and-a half per cents	370	-	-
Bill payable	110	-	-	Premises	230	-	-
				Wine	445	-	-
				Cash —At bank, 65 0 0			
				In hand, 50 0 0			
					115	-	-
	1,310	-	-		1,310	-	-

GERMAN.—X.

[Continued from p 178]

SOME ADVERBS.

Wo refers to the *place* where anything may be supposed to *exist* or *transpire*, as —Wo iſt mein Meſſer? where is my knife? Wo laufen die Kinder? where (in what place) are the children running?

Da is used in answer to wo—that is, to *designate* some particular place, as —Da iſt es, there it is; Da laufen ſie, they are running there.

Hin denotes direction, or motion from the speaker, as —Warum laufen die Kinder hin? why are the children running thither?

Her is the opposite in signification to hin, denoting motion or direction toward the speaker, as:—Warum laufen die Kinder her? why are the children running hither?

Hier signifies "in this place," as—Warum bleiben die Kinder hier? why do the children remain here?

These words are frequently compounded one with the other. Thus, from wo and hin we have the compound wohin, from wo and her, woher, from da and hin, dahin, from da and her, daher, from hier and hin, hierhin, and from hier and her, hierher (sometimes contracted to hieher).

EXAMPLES OF THE USE OF Wo, Da, Hin, Her, AND Hier.

Wo reiſen unſere Freunde hin? *or,*	Where do our friends travel to? *or,*
Wohin reiſen unſere Freunde?	Whither do our friends travel?
Sie reiſen dahin, wo ihre Verwandten wohnen.	They travel thither, where their relatives reside.
Wo kommen dieſe Zugvögel her? *or,*	Where do these birds of passage come from? *or,*
Woher kommen dieſe Zugvögel.	Whence do these birds of passage come?
Sie kommen daher, wo es jetzt zu kalt für ſie iſt.	They come from (there) where it is now too cold for them.
Wo iſt das größte Glück an dem Hofe eines tyran'niſchen Königs, oder in der Hütte eines zufrie'denen Tag'löhners?	Where is the greatest happiness: at the court of a tyrannical king, or in the cottage of a contented labourer?

Wo gehen Sie hin? an den Hof oder in die Hütte?	Whither do you go? to the court or into the cottage?
Der Feldherr ſitzt auf dem Pferde und reitet ruhig längs den Reihen der Sol-da'ten hin und her.	The commander-in-chief sits upon the horse and rides tranquilly along the ranks of the soldiers to and fro.
Morgen reitet er mit ſeinen Schaaren auf das Schlachtfeld.	To-morrow he rides with his troops to the battle-field.
In der Hoffnung finden die Un'glücklichen Troſt.	The unfortunate find consolation in hope.
Der Vater iſt da, aber der Bruder iſt in der Stadt.	The father is there, but the brother is in the city.
Ich gehe heute dahin, wohin ich ſchon geſtern gehen wollte.	I go to-day (thither) where I wished (already) to go yesterday.
Mein Freund wohnt hier, aber ſein Vater iſt in Berlin.	My friend lives here, but his father is in Berlin.

N. B.—Am = an dem.
Aufs = auf das
Ans = an das

VOCABULARY.

Auswanderer, *m.* emigrant.
Back'ſtube, *f.* bake-house.
Bald, soon.
Bil'dergallerie, *f.* picture-gallery.
Dolch, *m.* dagger.
Dringen, to press, enter in.
Einwanderer, *m.* immigrant.
Froſch, *m.* frog.
Gans, *f.* goose.
Hin'gehen, to go to.
Hirte, *m.* shepherd.
Irgendwo, somewhere.
Jetzt, now.
Kopf, *m.* head.
Liegen, to lie.
Mütze, *f.* cap.
Nirgends, nowhere.
Obgleich', although, notwithstanding.
O'pernhaus, *n.* opera-house.
Rache, *f.* revenge.
Ritter, *m.* knight.
Schau'ſpieler, *m.* actor.
Schon, already.
Schwager, *m.* brother-in-law.
Schwimmen, to swim.
Seiler, *m.* rope-maker.
Sitzen, to sit.
Springen, to spring, leap.
Stehen, to stand.
Teich, *m.* pond.
Werkſtatt, *f.* workshop.
Wohin'? whither? what way?
Zuck'erbäcker, *m.* confectioner.

EXERCISE 42.

Translate into English :—

1. Wo iſt der Schwager? 2. Er ſitzt an dem (am) Tiſche. 3. Wo geht der Zuckerbäcker hin? 4. Er geht in die Backſtube. 5. Wo iſt ſein Freund, der Schauſpieler? 6. Er iſt in dem Opernhauſe. 7. Wo geht ſein Freund, der Seiler, hin? 8. Er geht in ſeine Werkſtatt. 9. Wo iſt der Hirte? 10. Er iſt auf dem Berge. 11. Wo geht der Hirte hin? 12. Er geht auf den Berg. 13. Wo geht unſer alter Nachbar hin? 14. Er iſt jetzt in dem kleinen Garten, aber er geht bald in den großen Garten. 15. Seine Frau iſt in dieſem Hauſe, aber ſein Vetter geht in jene Bildergallerie. 16. Ich ſtehe an dem (am) Fenſter, und ſie kommen ans Fenſter. 17. Der Ritter ſitzt ſchon auf ſeinem guten Pferde, und der Knecht ſpringt auch ſo eben auf ſein gutes Pferd. 18. Der Mann ſitzt am Tiſche, und das Buch liegt auf dem Tiſche. 19. Ich habe keinen Hut auf dem Kopfe. 20. Wo geht der Soldat hin? 21. Die Soldaten gehen aufs Feld; ſie ſind ſchon auf dem Felde. 22. Der Froſch ſpringt in den Fluß und ſchwimmt in dem Fluſſe, und die Gans ſchwimmt auf dem Teiche. 23. Ich habe dieſe Worte irgendwo geleſen. 24. Ich kann meine Mütze nirgends finden, obgleich ſie irgendwo in dieſem Zimmer ſein muß.

EXERCISE 43.

Translate into German :—

1. Where is the picture-gallery of this town? 2. Where was that gentleman born? 3. He was born in Bohemia. 4. Where does your friend the actor reside? 5. He resides in the city. 6. Whither do these emigrants go? 7. Whence do these immigrants come? 8. They come from France. 9. Where much is given, much is required. 10. Here the revenge and whetted dagger of a traitor enter not; beneath the shade of this tree comes no king. 11. He threw down the book before me. 12. Whither art thou going? 13. I am going to my brother-in-law. 14. Will these emigrants go to America? 15. No, they will stop here. 16. There is water in the pond. 17. Where does she come from? 18. She comes from Germany.

Wo, Da, Hin, ETC.

Wo, da, hin, etc., besides being compounded one with another, are also united with prepositions, thus producing a separate class of adverbs, as :—Wovon ſprechen Sie? of what (whereof) are you speaking? Ich ſpreche von meinen Büchern; wollen Sie eins davon haben? I am speaking of my books; will you have one of them (one thereof)? Ich bin auf dem Dache; kommen Sie herauf! I am on the roof; come up! Ich kann nicht hinauf gehen; kommen Sie herab! I cannot go up; you come down!

Hinab, hinauf, hinaus, herab, etc., when used with nouns, are translated by prepositions; and the adverb, unlike its English equivalent, is placed *after* the noun, as :—Ich gehe den Berg hinauf, I go *up* the mountain; Kommen Sie den Berg herab, come *down* the mountain.

The verb kommen may frequently be translated into English by "*get*" as :—Wie iſt er in dieſen Garten gekommen? how did he *get* into this garden? Er weiß nicht, wie er heraus kommen ſoll, he does not know how to *get* out; Ich komme mit dieſem Manne ſehr gut fort, I *get* along with this man very well.

EXAMPLES.

Sie ſehen hinab' in das wilde Meer.	They look down into the wild sea.
Da gießt unend'licher Regen herab'.	There pours down interminable rain.
Die Knaben eilten den Berg hinauf'.	The boys hastened up the mountain.
Der Bergmann ſteigt herauf' aus der Tiefe des Schachtes.	The miner comes up out of the depth of the shaft.
Petrus ging hinaus' und weinte bit terlich.	Peter went out and wept bitterly.
Und hinein' mit bedäch'tigem Schritt ein Löwe tritt.	And thither (therein) with deliberate steps a lion strides.
Er wirft ſich in die brau'ſende Fluth.	He throws himself into the roaring flood.
Der Richter rief den Bauer herein'.	The judge called the peasant in.
Das Leben des Menſchen ſchwankt, wie ein Nachen, hinü'ber und herü'ber.	The life of man, like a skiff, fluctuates hither and thither.
Der Dach'decker fiel vom Hauſe herun'ter.	The tiler fell down from the house.

VOCABULARY.

Brau'ſen, to roar.
Cajü'te, *f.* cabin.
Caſer'ne, *f.* barrack.
Dampfboot, *n.* steamboat.
Dieb, *m.* thief.
Eiſenbahn, *f.* railroad.
Empfangen, to receive.
Erſchreck'en, to terrify.
Felſen, *m.* rock.
Gerauſch, *n.* noise.
Gefahr, *f.* danger.
Haſe, *m.* hare.
Herab'ſtürzen, to precipitate.
Herauf'kommen, to come up.
Heraus'kommen, to come out.
Heraus'ſtürzen, to rush, spring out.
Herein'kommen, to come in.
Herein'ſtürmen, to rush in.
Herü'berfahren, to come over (in a vehicle).
Herü'berkommen, to come over.
Herun'tereilen, to hasten down.
Herun'terkommen, to come down.
Hinab'gehen, to go down.
Hinab'ſpringen, to leap down.
Hinauf'laufen, to run up.
Hinaus'gehen, to go out.
Hinaus'kommen, to come out.
Hinein'gehen, to go in.
Hinü'berfahren, to pass over.
Hinü'berkommen, to come over.
Hinü'berſchauen, to look over.
Hinun'tergehen, to go down.
Hügel, *m.* hill, hillock.
Kreuzweg, *m.* crossway.
Lauf, *m.* course, current.
Nachtwache, *f.* watch.
Reh, *n.* roe.
Schiffsbrücke, *f.* bridge of boats.
Schweizer, *m.* Swiss.
Straße, *f.* street.
Strom, *m.* stream.
Stunde, *f.* hour.
Thüre, *or* Thür, *f.* door.
Treppe, *f.* stair.
Treten, to tread, step.
Über, over, beyond.
Va'terland, *n.* native country.
Während, during, while.
Wenn, if.
Wieder, again.
Zwi'ſchendeck, *n.* deck (between deck).

EXERCISE 44.

Translate into English:—

1. Haben Sie meinen Freund geſehen? 2. Ja, er iſt die Straße hinabgegangen. 3. Wollen Sie in die Cajüte hineingehen? 4. Nein, ich gehe in das Zwiſchendeck hinunter. 5. Fahren Sie heute mit dem Dampfboote nach Mainz hinüber? 6. Ja, und dieſen Abend werde ich mit der Eiſenbahn über die neue Schiffsbrücke wieder herüberkommen. 7. Hinab, hinauf geht unſer Lauf. 8. Das Reh ſprang den Berg hinab, während der Haſe den Hügel hinauflief. 9. Die Soldaten ſtürzten aus der Caſerne heraus, als der Feind in die Stadt hineinſtürmte. 10. Als die Nachtwache in das Haus trat, eilte der erſchrockene Dieb die Treppe herunter. 11. Ich kann nicht aus den Kreuzwegen dieſes Gartens hinauskommen. 12. Wiſſen Sie nicht, wie dieſer Vogel hereingekommen iſt? 13. Ja, aber er weiß nicht, wo er wieder hinauskommen kann. 14. Der junge Schweizer ſchaute hinüber nach den blauen Bergen ſeines Vaterlandes. 15. Kommen Sie heute nicht herunter? 16. Ja, wenn der Oheim heraufkommt, werde ich hinabgehen. 17. Haben Sie dieſen Mann ſchon geſehen? 18. Ja, er kam zur Thüre herein, als ich hinausging. 19. Der Freund fuhr in einer Stunde den Fluß hinüber und herüber. 20. Der Strom ſtürzt mit großem Geräuſch den Felſen herab.

EXERCISE 45.

Translate into German:—

1. The son hastened down to receive his father. 2. His speech lasted over two hours. 3. The roe sprang out from her hiding-place. 4. Will you go over to Frankfort to-day by the steamboat? 5. No, I shall go over by the railroad and return by the steamboat. 6. Do not go beyond the crossway. 7. I saw your friend come in as your uncle went out. 8. These men who go over that bridge are in danger of their lives. 9. Will you go out to-day with your friend? 10. From this hill we can look over our country. 11. How did the thief get into your house? 12. Edward precipitated himself from the rock. 13. I shall pass your house this morning, and shall come in, without your asking me to do so.

POSITION OF THE VERB.

When for the sake of emphasis a word (which is not the subject) is placed at the beginning of a principal sentence, or if a subordinate sentence precedes the principal sentence, the subject is placed after the finite verb (a present or imperfect), as:—Da geht Ihr Freund, there goes your friend; Hier ſteht ſein Bruder, here stands his brother; Zu lange ſchon haſt Du geſchlummert, too long already hast thou slumbered; Jetzt muß ich gehen, now I must go; Als ich geſtern nach Hauſe kam, regnete es ſehr ſtark, when I returned home yesterday, it was raining very hard; Heute kann er nicht leſen, und morgen will er nicht, he cannot read to-day, and to morrow he will not.

Fahren.—Fahren is used both transitively and intransitively. When transitive it is conjugated with haben, and signifies to *convey* in a vehicle, to drive, as:—Der Kutſcher hat mich ſchnell gefahren, the coachman has driven me rapidly; Der Schiffer hat mich ſchnell gefahren, the boatman has rowed me rapidly. When intransitive it is conjugated with ſein, and signifies to *ride* in a vehicle, as:—Ich bin gefahren, I have ridden (in a carriage, boat, or other vehicle).

Reiten.—Reiten is also used transitively and intransitively, and signifies to ride, as on horseback, as:—Der Araber reitet das Pferd und das Kameel, the Arabian rides the horse and the camel; Ich habe ein ſchnelles Pferd geritten, I have ridden a fleet horse. When used intransitively it is conjugated with ſein, as:—Er iſt ſehr ſchnell geritten, he has ridden (on horseback) very rapidly.

EXAMPLES.

Da blühet eine Roſe, und hier fällt eine ab.	There a rose blossoms, and here one falls off.
Hier ſteht der Jüngling, und da der Greis.	Here stands the youth, and there the aged man.
Morgen verläßt das neue Dampfboot den Hafen.	To-morrow the new steamboat leaves the harbour.
Zu lange ſchon haſt du geſäumt', die verlor'ne Zeit ein'zuholen.	Too long already hast thou delayed to redeem the lost time.
Jetzt muß ich meinem Brief ſchließen.	I must now close my letter.
Heute kann er nicht froh ſein, und morgen nicht lachen. Sprichwort.	To-day he cannot be joyful, and to-morrow not laugh. Adage.

VOCABULARY.

Fahren, to drive, to ride (in a vehicle).
Frankfurt, *n.* Frankfort.
Früh, early.
Geſund', healthy.
Holz, *n.* wood, timber.
Holz'hauer, *m.* woodcutter.
Ja, *adv.* yes, indeed.
Kalt, cold.
Leben, to live.
Mäßig, temperate, temperately.
Metzger, *m.* butcher.
Ordentlich, orderly.
Reiten, to ride (on horseback).
Reitpferd, *n.* saddle-horse.
Schlachten, to butcher, kill, *or* slay.
Suchen, to seek.

EXERCISE 46.

Translate into English:—

1. Will der alte Soldat heute in den Wald gehen? 2. Er will hingehen, aber heute kann er nicht, denn er hat viel zu thun. 3. Der Hausknecht iſt auf den Markt gegangen, um Fleiſch zu holen. 4. Um geſund zu bleiben, muß man ordentlich und mäßig leben. 5. Der Holzhauer iſt in den Wald gegangen, um Holz zu hauen. 6. Der Metzger geht von einem Dorfe zum andern, um Ochſen zu kaufen. 7. Er geht aus einem Dorfe in das andere, kann aber keine Ochſen finden. 8. Was will er mit den Ochſen? 9. Er will ſie ſchlachten; wir müſſen ja Fleiſch haben. 10. Der Bauer hat zwei Pferde, welche der Brauer kaufen will. 11. Ich gehe in die Stadt, um einen Hut oder eine Mütze zu kaufen. 12. Er hat Bücher zu leſen und eine Aufgabe zu ſchreiben. 13. Wo will der Freund Ihres Bruders hingehen? 14. Er will nirgends hingehen, er will bei ſeinem Oheim bleiben. 15. Wollen ſie auf den hohen Berg gehen? 16. Ich will dahin gehen, aber nicht heute. 17. Können Sie morgen auf das Land gehen? 18. Ich kann dahin gehen, aber ich will nicht. 19. Wann will Ihr Vater ſeine Pferde wieder haben? 20. Er muß ſie morgen früh haben, weil er morgen Abend nach Frankfurt fahren will. 21. Warum will er nicht dahin reiten? 22. Weil er kein gutes Reitpferd hat, und das Wetter ſehr kalt iſt.

EXERCISE 47.

Translate into German:—

1. It is too cold for him to-day to go over to Frankfort. 2. There runs the hare over the hill. 3. There drives your brother. 4. The confectioner is gone to the bakehouse in order to bake bread. 5. The butcher goes to market in order to buy sheep. 6. Your coachman has driven me rapidly here. 7. Do you see that man upon that horse which we saw yesterday? 8. The soldiers ride on beautiful horses. 9. They say one rides in those carriages comfortably. 10. We have ridden in your coach to pay our visits. 11. Tread not beyond the law! 12. The new steamboat passes down the river to-day for the first time.

COMPARISON OF ADJECTIVES.

German adjectives are compared by suffixing to the simple form of the *positive*, -er for the *comparative*, and -eſt for the *superlative*; thus, *positive* mild (mild), *comparative* mild-er (milder), *superlative* mild-eſt (mildest). In this respect German resembles English.

When the positive ends in -el, -en, or -er, the e of this termination is, in the comparative, omitted, as:—edel (noble), edler (nobler). It may be here remarked that adjectives of this class add for the *superlative* -ſt only—thus, edel, edler, edelſt. Adjectives, when compared, are commonly contracted when euphony admits.

Adjectives in the comparative and superlative are subject to the same rules of inflection as when in the positive degree.

INFLECTION OF THE ADJECTIVE IN THE COMPARATIVE AFTER THE STRONG DECLENSION.

	Masc.	*Fem.*	*Neut.*	*Plural for all genders.*	
N.	Schönerer,	ſchönere,	ſchöneres,	ſchönere,	finer.
G.	Schöneren,	ſchönerer,	ſchöneren,	ſchönerer,	of finer.
D.	Schönerem,	ſchönerer,	ſchönerem,	ſchöneren,	to finer.
A.	Schöneren,	ſchönere,	ſchöneres,	ſchönere,	finer.

INFLECTION AFTER THE WEAK DECLENSION.

	Masc.	*Fem.*	*Neut.*
N.	Der ſchönere,	die ſchönere,	das ſchönere, the finer.
G.	Des ſchöneren,	der ſchöneren,	des ſchöneren, of the finer.
D.	Dem ſchöneren,	der ſchöneren,	dem ſchöneren, to the finer.
A.	Den ſchöneren,	die ſchönere,	das ſchönere, the finer.

Plural for all genders.

N. Die ſchöneren, the finer.
G. Der ſchöneren, of the finer.
D. Den ſchöneren, to the finer.
A. Die ſchöneren, the finer.

Superlatives of the Strong Declension are used only in address, as :—Liebſter Bruder, dearest brother; Theuerſte Mutter, dearest mother ; Liebſte Freunde, dearest friends, etc.

INFLECTION OF THE SUPERLATIVE AFTER THE WEAK DECLENSION.

	Masc.	*Fem.*	*Neut.*
N.	Der ſchönſte,	die ſchönſte,	das ſchönſte, the finest.
G.	Des ſchönſten,	der ſchönſten,	des ſchönſten, of the finest.
D.	Dem ſchönſten,	der ſchönſten,	dem ſchönſten, to the finest.
A.	Den ſchönſten,	die ſchönſte,	das ſchönſte, the finest.

Plural for all genders.

N. Die ſchönſten, the finest.
G. Der ſchönſten, of the finest.
D. Den ſchönſten, to the finest.
A. Die ſchönſten, the finest.

The Strong form of the superlative is rarely used ; the article (as in English) always preceding it, as :—Mein Hut iſt der ſchönſte, my hat is *the* finest. Instead of the regular form, the dative of the Weak Declension, preceded by the particle am, contracted from an dem, is often used, as :—Mein Hut iſt am ſchönſten.

The adverb mehr, like its English equivalent (more), is likewise employed in the comparison of adjectives, as :—Sie iſt mehr liebenswürdig, als ſchön, she is more amiable than beautiful.

Adjectives of all degrees of comparison may in the simple and absolute form be employed as *adverbs;* but when the superlative is so used, the form produced by the union of am with the dative is adopted, as :—Er ſchreibt ſchön, he writes beautifully; Er lieſt ſchneller, als ich, he reads more rapidly than I; Sie lieſt am ſchnellſten, she reads the most rapidly.

Participles, when used as adjectives, are compared in the like manner, as :—Gelehrt (learned), gelehrter (more learned), gelehrteſt (most learned); rührend (affecting), rührender (more affecting), rührendſt (most affecting).

Je . . . je or je . . . deſto, in phrases like the following, is answered in English by " the . . . the." Thus, Je mehr, je munterer, *the* more, *the* merrier; Je mehr, deſto beſſer, *the* more, *the* better. Je is sometimes *preceded* by deſto, as :—Ein Werk iſt deſto nützlicher, je vollkommener es iſt, *the* more perfect a work is, *the* more useful it is.

Deſto is likewise used without je, as :—Er lief darauf deſto ſchneller, thereupon he ran *the* faster; Er hörte nun deſto aufmerkſamer zu, he listened now the more attentively.

The following adjectives are irregular in comparison :—

Positive.	*Comparative.*	*Superlative.*
Gut, good.	Beſſer, better.	Beſt *or* am beſten, best.
Hoch, high.	Höher, higher.	Höchſt *or* am höchſten, highest.
Nahe, near.	Näher, nearer.	Nächſt *or* am nächſten, nearest.
Viel, much.	Mehr, more.	Meiſt *or* am meiſten, most.
Wenig, little *or* few.	Weniger, minder, less *or* fewer.	Wenigſt *or* mindeſt, least *or* fewest.

KEY TO EXERCISES.

Ex. 35.—1. Will you go with me to Mannheim? 2. I cannot; I have no time. 3. When can you go? 4. I shall go (the) next week, if you can wait so long. 5. Will your teacher go with you to the field, or to the town? 6. He will not go to the field, and cannot go to the town? 7. What do these children want? 8. They want some apples and cherries; but they can buy none, for they have no money. 9. What do you wish, Sir? 10. Will you have the kindness to give me a glass of water? 11. Can you tell me what o'clock it is? 12. I cannot tell you; I have no watch with me. 13. What was the merchant going to sell you? 14. I could find nothing at his shop that I wished to buy. 15. We shall have bad weather to-morrow. 16. It may be that it will still rain to-day. 17. Can you read the German handwriting? 18. No, I have enough to do with the print. 19. The envious man will not praise his friend. 20. A learned woman is not always a good housewife. 21. Patience is a difficult attainment; many can teach it, but not learn it. 22. A good teacher must have patience. 23. Every good scholar will be attentive.

Ex. 36.—1. Sie mögen in den Garten gehen, aber Sie dürfen nicht lange dort bleiben. 2. Dieſe aufmerkſamen Schuler durften mit ihrem Lehrer nach Mannheim
3. Wir können unſere Zeit beſſer anwenden. 4.
Sie Deutſch ſprechen? 5. Wir konnten unſere Aufgaben dieſe Woche nicht lernen. 6. Sie müſſen die Aufgaben dieſer Woche aufmerkſam lernen. 7. Sie mögen morgen zu Ihren Eltern gehen. 8. Er mag ein guter Mann ſein. 9. Die Hausfrau muß morgen auf den Markt gehen. 10. Haben Sie Ihren Eltern geſchrieben? 11. Ja, ich mußte ſchreiben. 12. Es iſt zwei Uhr. 13. Ich werde bei Ihnen (an Ihrem Hauſe) ein Viertel auf vier Uhr ankommen. 14. Wollen Sie zwanzig Minuten vor acht Uhr kommen. 15. Ich mag dieſen Abend zu Ihnen kommen, aber warten Sie nicht auf mich. 16. So lange als es regnet, kann ich nicht ausgehen. 17. Fiſche können nur im Waſſer leben,
Vögel in der Luft. 18. Sie hatten das nicht thun
es wird keine Empfehlung für Sie ſein. 19. Ich will heute Abend nach dem (*or* ins) Theater gehen. 20. Wir mögen ein anderesmal dieſe Gelegenheit nicht haben.

Ex. 37.—1. I must go to the meadow to fetch hay. 2. What is your brother to do at school? 3. He is to go to school, to learn the Latin language. 4. Man must be honest or wretched. 5. What am I to do? 6. You may do what you like, and should do what you can. 7. Why did you not come to our house yesterday? 8. I would, but I could not; I was obliged to stay at home and read. 9. Will the tailor be willing to make me a coat? 10. He will be willing to make you one, but he will not be able to do it. 11. Why will he not be able to do it? 12. He will be obliged to go in the country to-morrow, to see his sick brother. 13. What does the boy want with his knife? 14. He wishes to cut bread and cheese. 15. Have you time to go into the stable? 16. I have time, but I will not go; I will remain at home. 17. What have you to do at home? 18. I have letters to read and to write. 19. Are you obliged to write them to-day? 20. I must write them to-day, because I am going to Heidelberg to-morrow. 21. One must be cautious in the choice of one's friends. 22. This boy has learnt nothing at all to-day. 23. Have you also learnt nothing? 24. I have learnt something, but not much.

Ex. 38.—1. To whom are you going? 2. I am going to my brother. 3. With whom is this boy going? 4. He is going with his father to the town. 5. From whom did you hear this news? 6. I heard it from my old friend. 7. With whom are you going to the village? 8. I am not going to the village; I am going with my father to the great town. 9. When are you going out of the town to our friends? 10. We are not going to your friends; we are coming home again to-morrow. 11. I am going neither to my friend to-day, nor to the village, nor out of the house. 12. The count has a great castle with little windows. 13. The river comes from the mountains. 14. Has your father heard anything from his brother? 15. Yes, this man is (come) from Hungary, and has brought my father a box from my uncle. 16. Is he going to Vienna? 17. No, he is going to Warsaw, and from Warsaw to Cracow. 18. The Bavarian, the Bohemian, and the Hessian come from Germany. 19. The huntsman with his gun comes from the forest. 20. The servant is going to the town. 21. I heard from my brothers you were going to their friend. 22. The servant-girl comes from the well, and the man-servant goes to the butcher.

Ex. 39.—1. Wenn wir glücklich ſein wollen, dürfen wir nicht vom Pfade der Tugend abweichen. 2. Ich weiß, daß er Ihr Freund nicht iſt, aber ich weiß gleichfalls, daß er ein Mann von Redlichkeit iſt. 3. Laßt ſie wiſſen, daß dieſe Neuigkeiten nur Gerüchte ſind. 4. Man muß nicht alles ſagen, was man weiß. 5. Sie müſſen in der Wahl Ihrer Freunde ſehr vorſichtig ſein. 6. Wir ſollten wiſſen, an wen wir uns wenden. 7. Wollen Sie dem Schneider ſagen, wenn er Ihren Rock fertig habe, bei mir vorzuſprechen? 8. Haben Sie die Zeit, mit mir nach der Stadt zu gehen? 9. Wenn er die Arbeit nicht hätte zu Stande bringen können, würde er ſie nicht unternommen haben. 10. Haben Sie Zeit, dieſen Brief zu leſen? 11. Er geht in die Schule, um die lateiniſche Sprache zu lernen.

Ex. 40.—1. On this intelligence, the riders urged their horses to greater speed. 2. The beautiful greenfinch has flown away from the boy. 3. The prospect of a rich reward incited them to rescue the rich nobleman's child. 4. The peasant has collected his fruit of the field, thrashed, and stored it up. 5. The revengeful man is fond of using the adage, "Deferred is not revoked." 6. The hermit lives in his cell, separated from the people. 7. The war has destroyed many people, but the plague still more. 8. The sun has set. 9. On the termination of the war, the king discharged many soldiers. 10. The loadstone attracts iron and lightning. 11. The magnetic needle shows the pilot the north and the south. 12. The threatenings, as well as the promises, in the Bible indicate the love of God. 13. The copper kettle has attracted verdigris. 14. The miller has disposed of his flour. 15. The father has confined the dog in his room. 16. The merchant praises the cloth to his customers. 17. Prayer elevates an afflicted heart. 18. The moon ascends behind the chain of mountains, and fills the earth with her mild light. 19. I get into the waggon, you get out of the waggon, and he mounts the horse. 20. The tired riders dismount from their horses. 21. Will you take me with you when you go to Germany? 22. I do not think you are willing to go with me.

Ex. 41.—1. Nach Beendigung des Krieges werden die Soldaten abbezahlt werden. 2. Ich werde mit Ihrem Bruder zu dem Eremiten gehen, der abgeſondert von der Welt lebt. 3. Der Landmann hat die Früchte des Felde eingeſammelt. 4. Die Bürger ſind von dem Feinde in der Stadt eingeſchloſſen. 5. Der Krieg und die Peſt haben ſehr viele Menſchen umgebracht. 6. Der müde Reiter ſteigt von ſeinem Pferde ab. 7. Der Kaufmann hat ſeinen Vorrath abgeſetzt. 8. Die Sonne geht im Oſten auf. 9. Die Sonne geht zwanzig Minuten nach fünf Uhr auf, und geht um halb ſieben Uhr unter. 10. Sie müſſen Ihre Schüler anſpornen fleißiger zu ſein. 11. Wollen Sie Ihren Beſuch für Morgen aufſchieben? 12. Die Magnetnadel zeigt nach dem Norden. 13. Der Schüler hat ſeine Aufgaben abgeſchrieben.

GEOGRAPHY.—X.

[*Continued from p.* 146.]

AMERICAN POSSESSIONS OF GREAT BRITAIN (*continued*).

CANADA (*continued*).

Surface and Drainage.—With the exception of this plateau in the west, the eastern range of which reaches 16,000 feet in Mounts Hooker and Brown, and the lower ranges of the Wotchish Mountains (1,500 feet) between Quebec and Labrador and the Green Mountains (4,000 feet), dividing Quebec from the State of Maine, and terminating in the Gaspé Peninsula, Canada is mainly a great plain draining northward. Besides the Fraser River, flowing south and west, and smaller streams in the north of British Columbia, draining into the Pacific, the principal river-basins are those of (i.) the Mackenzie (2,000 miles), with its tributaries the Athabasca, Peace, and Slave Rivers, estimated at 442,000 square miles, and (ii.) the Great Fish, or Back River, draining into the Arctic Ocean; (iii.) the Churchill, or Missinippi (1,300 miles), draining 74,000 square miles, and (iv.) the Nelson, with its tributaries the Saskatchewan, Assiniboine, and Red Rivers (1,400 miles), draining 360,000 square miles, flowing into Hudson's Bay; and (v.) the St. Lawrence, with its tributary the Ottawa (1,400 miles), draining 298,000 square miles into the

Atlantic. The immense number and large size of the fresh-water lakes is one of the most striking features of the country. In the St. Lawrence Basin are Superior, Michigan, Huron, St. Clair, Erie, and Ontario. Superior is 335 miles long, *i.e.*, about the length of England, and has an area of 32,000 square miles—about that of Ireland—being the largest fresh-water lake in the world. Its mean depth is 668 feet, and its elevation above the sea 627 feet. Michigan, with an area of 23,000 square miles, is surrounded by United States territory. Huron is 20,000 square miles. In the Nelson Basin are Rainy Lake, Lake of the Woods, Winnipeg (9,000 square miles), at an altitude of 710 feet, Manitoba, and Winnipegosis, and in the Mackenzie Basin are Athabasca (3,400 square miles), Great Slave Lake (12,000 square miles), and Great Bear Lake (14,000 square miles). Lake Ladoga, the largest lake in Europe, has an area of 7,150 square miles. These lakes and rivers afford an invaluable system of inland navigation, impeded, however, by falls and rapids. The northern rivers are, in consequence, hardly navigable. This is a serious drawback in the case of the Nelson, since, though Hudson Bay and Strait is blocked by ice during great part of the year, the shortest route from Liverpool to the Canadian North-west would be *viâ* Port Nelson at the mouth of the river, by which large supplies of corn are destined to be brought to England. The Falls of Niagara, between Erie and Ontario, over half a mile wide and 160 feet high, are the most magnificent in the world.

Climate.—The climate is typically continental or extreme, snow lying on the ground from December to March, even in the south, and the St. Lawrence being usually frozen for five months as far down as Quebec. The air is dry and clear, except in the coast regions of British Columbia, Nova Scotia, and Prince Edward Island. The short hot summers, however, thaw the ground so that wheat will germinate and ripen within three or four months without rain.

Mineral Resources.—Though by no means fully developed as yet, the mineral resources of the Dominion are rich and varied. Coal is worked in Cape Breton Island, Nova Scotia, New Brunswick, Alberta, British Columbia, and Vancouver Island; petroleum is abundant in Ontario; iron in Nova Scotia, Ontario, and Vancouver Island; gold in Nova Scotia and Alberta, but especially in British Columbia; copper near the shores of Lakes Superior and Huron; and phosphate of lime (valuable as a manure) also in Ontario.

Plants.—Whilst in the far north trees are represented only by the Dwarf Willow, six inches high, much of the south-east is still covered by extensive forests, chiefly of pines and firs, the timber or "lumber" of which forms the chief trade of Quebec and Ontario. The Hemlock Spruce, the bark of which is valued for tanning in these provinces; the Birches; the Maples, from which sugar is prepared in the south-east; and the magnificent Oregon Pine, or Douglas Spruce, of the Coast Range, in British Columbia, are among the more noteworthy trees.

Animals.—Among the wild animals, especially in the North-West, are, as above-mentioned, many kinds yielding valuable furs. The birds are all songless. The shores and rivers, especially in the west, abound in fish.

Population, &c.—Of a population of nearly five million, less than 1½ per square mile, the majority are British immigrants and their descendants, except in the province of Quebec, where five-sevenths of the population are of French extraction. These mostly speak a French *patois* and are Roman Catholics. There are about 100,000 Indians, mostly nomad hunters in the North-West. Of the entire population of the Dominion the Catholics form nearly a third, the Methodists more than a fifth.

Industries and Commerce.—The lumber trade, still by far the most important industry in Quebec, and to a less extent in Ontario, is fast giving place to agriculture. Horses and sheep are largely reared in Prince Edward Island; apples are exported to Europe from Nova Scotia and Ontario; cheese from Ontario; and wheat in increasing quantities especially from that province and Manitoba. The fisheries of Nova Scotia, New Brunswick, and British Columbia are important. The fur trade, formerly the chief trade of the Hudson Bay Company, belongs chiefly to British Columbia and the North-West. The mining industries have been already mentioned. Manufactures are increasing; but iron and steel, woollen and cotton goods form, with coal and sugar, the chief imports. Trade is chiefly carried on with Great Britain and the United States, the annual imports being about 10 million and the exports 18 million sterling.

Inland Communication.—In addition to the valuable natural water-ways, Canada is being rapidly supplied with railways, of which over 12,000 miles are now open. The Canadian Pacific Railway, opened in 1886, extends from Montreal, through Ottawa, Port Arthur, Winnipeg, Qu'Appelle, Regina, to Vancouver, a distance of 2,906 miles. Besides direct communication with Quebec, it has several branches. In the eastern provinces there are many lines in communication with the railway-system of the United States, and a line has been surveyed from Winnipeg northward to Port Nelson (600 miles). Canals render possible the navigation of the St. Lawrence from its mouth to Lake Superior.

Government.—The executive is exercised by a Governor-General, appointed by the Crown, with a Privy Council; the legislature is a Senate of 80 life-members, nominated by the Ministry, and a House of Commons of 215 representatives; and the judicature is similar to that of England. Free education is provided throughout Canada.

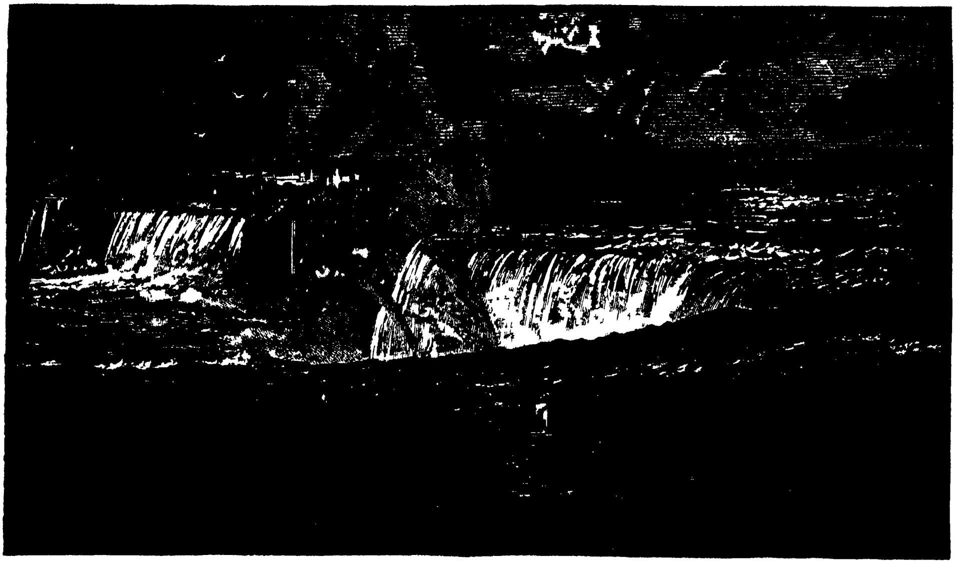
Divisions and Chief Towns.—The Dominion is divided into eight provinces, each with a lieutenant-governor, council, and legislature.

1. NOVA SCOTIA, the easternmost province, formerly the French Acadie, includes a peninsula, connected with New Brunswick by the *Isthmus of Chignecto*, and *Cape Breton Island*, separated by the *Strait of Canso*. Its area is over 20,000 square miles, or two-thirds that of Scotland, and its population 440,000. The soil is fertile, hay, apples and other fruit being largely produced; coal is abundant, and the cod, mackerel, herring, salmon, and lobster fisheries are important. **Halifax** [40], on the east coast, 2,680 miles, or 8 days, from London, *viâ* Moville, has a fine harbour, Government docks, and trade with the West Indies and South America.

2. PRINCE EDWARD ISLAND, separated from Nova Scotia and New Brunswick by *Northumberland Strait*, has an area of only 2,133 miles and a population of 109,000. **Charlottetown** [14] has a good harbour.

3. NEW BRUNSWICK, with valuable forests, fisheries, and ship-building trade, has an area of 27,000 square miles and a population of 321,000. **Fredericton** [6], on the St. John's River, is in the interior. *St. John* [30], on the *Bay of Fundy*, at the mouth of that river, is the chief port, and is 2,600 miles, or 9 days, from London.

4. QUEBEC, north of the Ottawa river, on both sides of the St. Lawrence, including the *Gaspé Peninsula*, has an area over 188,000 square miles, or more than twice that of Great Britain, with a population exceeding 1,400,000. **Quebec** [65], 2,930 miles, or 8 days, from London, *viâ* Moville, 2,630 miles from Liverpool, and 2,560 from Glasgow, the centre of the lumber export trade, is fortified, commanding the mouth of the St. Lawrence. *Montreal* [189], the commercial capital and centre of the grain trade of the Dominion, is 150 miles higher up the river, on an island at the mouth of the Ottawa and at the head of the ocean navigation.



THE FALLS OF NIAGARA.

5. ONTARIO, mainly a peninsula between the Ottawa river, Lake Huron, and Lakes Erie and Ontario, has an area of 181,800 square miles and a population of over 2 millions. It is rich in petroleum and produces much wheat and lumber. **Toronto** [138], on Lake Ontario, 300 miles above Montreal, is the seat of a university. **Ottawa** [37], the capital of the Dominion, has a large lumber trade and woodenware manufactories. It is in long. 75° 43′ W., so its time is 5 hours slow by Greenwich. *Hamilton* [43], at the west end of Lake Ontario, is the Birmingham of Canada. *London* [26], on the Thames, is an agricultural centre.

6. **MANITOBA**, formerly the Red River Settlement, in the centre of the continent, has a most fertile, wheat-producing soil, yielding nearly 28 bushels per acre. **Winnipeg** [20], on the Canadian Pacific Railroad, had a population under 250 in 1871.

7. NORTH-WEST TERRITORIES, extending from Labrador to the Rocky Mountains and Alaska, are estimated to contain over 2½ million square miles, with only 79,000 inhabitants, one-third at least of whom are Indians. The provisional districts of ASSINIBOIA, SASKATCHEWAN, ALBERTA, ATHABASCA, and KEWATIN have been demarcated. Coal occurs, especially in Alberta, where also stock is raised and much hay and wheat are produced. **Regina** [1½], in Assiniboia, is 4,750 miles, or 14 days, from London, *viâ* the Canadian Pacific Railroad.

8. BRITISH COLUMBIA, including Vancouver and Queen Charlotte Islands, contains over 340,000 square miles, or nearly eight times the area of Great Britain, with a population of 60,000. Mainly peopled in 1858 on the discovery of gold, the timber of the Cascade Range the fur trade of the North, the salmon, thousands of tons of which are annually tinned for export to England, and the excellent coal in the islands, are now important resources. **Victoria** [14], on the *Straits of Juan de Fuca*, at the south of Vancouver Island, is connected by rail with *Esquimalt*, the North Pacific Naval Station, where there is a large dock, and with *Nanaimo* [7] the centre of the coal-fields. *Vancouver* [8], the terminus of the Canadian Pacific Railroad, has steamers to Japan and Hong-kong, and has outstripped *New Westminster* [5], the former capital.

NEWFOUNDLAND, between lat. 46° 37′ and 51° 39′ N. and long. 52° 35′ and 59° 25′ W., is an island of 40,200 square miles, or one-third larger than Ireland, with a population of 196,411. Its east coast is washed by a cold current bringing many cod to the shallow bank off the coast. Cod, seal, salmon, lobster, and herring fisheries and copper mines are the chief industries. Government is administered by a Governor, Executive and Legislative Councils, and elective House of Assembly. **St. John's** [31], on the east coast, is 2,196 miles by sea, or 7½ days, from London. The coast of LABRADOR, from Cape Chudleigh, at the entrance of *Hudson's Straits* to the *Strait of Belle Isle*, north-west of Newfoundland, with a few Moravian missions, mainly frequented during the cod-fishing season, is under the same administration.

The BERMUDAS, or SOMERS ISLANDS, a group of small islands in lat. 32° 15′ N. and long. 64° 51′ W., with an area of 41 square miles and a population of 16,000, are about 580 miles from Cape Hatteras, North Carolina, and 750 from Nova Scotia. The climate is mild and healthy. Arrowroot and fruit are the chief produce, and the islands are now a favourite American winter resort for invalids. There is a Governor, Council, and elected Assembly. **Hamilton**, on Long Island, is 2,970 miles, or 14 days, from London. There is a fortified dockyard for the North-American squadron.

THE WEST INDIES, discovered and named by Columbus in 1492, are an immense number of islands, lying between 10° and 27° N. lat., and between 59° and 85° W. long. Their whole area is about 95,000 square miles, or little more than that of Great Britain, and their population about four millions, one half of whom are negroes and the remainder chiefly mulattoes—hardly any of the original Carib inhabitants remaining. With the exception of the flat coralline Bahamas to the north, the islands are mostly volcanic and mountainous. The climate is tropical, snow being quite unknown; the rainfall excessive, and hurricanes frequent, especially in September. There are generally two wet and two dry seasons, the former being very unhealthy. Yams, sweet potatoes, and manioc, or cassava, form the staple foods of the natives; bananas, pine-apples, and oranges, with other fruits, grow freely; mahogany, red cedar, lignum-vitæ, logwood, and fustic are among the timber trees, the two latter being exported as dyes; and sugar, rum, coffee, tobacco, pimento, and ginger are among the other chief articles of export. The archipelago may be well subdivided into (1) the Bahamas, (2) the Greater Antilles, to the west, including Cuba, Jamaica, Hayti, and Puerto Rico, and (3) the Lesser Antilles, to the east. The latter group includes the Virgin Islands, those inappropriately known by us as the Leeward and Windward Islands respectively, Barbados and Trinidad. With the exception of Hayti, all the islands belong to European Powers, Spain holding about half the entire area, including Cuba and Puerto Rico, and Great Britain an area of about 13,750 square miles, with a population of nearly 1¼ million. The BAHAMAS comprises about twenty inhabited islands, with a total area of about 5,800 square miles and a population of 48,000. Sponges, pine-apples, tomatoes, and oranges are the chief exports. There is a Governor, Executive and Legislative Councils, and a Representative Assembly. **Nassau** [12], on New Providence, 4,000 miles, or 14 days, from London, is a winter resort of Americans.

JAMAICA, the largest and most valuable British West Indian island, is 144 miles long and 49 broad, containing 4,193 square miles and a population of 580,804, four-fifths negroes. The *Blue Mountains* reach 7,360 feet. There are several excellent shillings, etc. The process of expressing a compound quantity given in any one denomination in another is called *reducing* the quantity to a given denomination. The process is termed *Reduction.*

2. **Example 1.**—Reduce £5 2s. 7¾d. to farthings.

Since there are 20 shillings in a pound, in 5 pounds there are 5 × 20, or 100 shillings; and therefore, in £5 2s., 100 + 2, or 102 shillings. Since there are 12 pence in a shilling, in 102 shillings there are 102 × 12, or 1224 pence; and therefore, in £5 2s. 7d., 1224 + 7, or 1231 pence. Since there are 4 farthings in a penny, in 1231 pence there are 1231 × 4, or 4924 farthings; and therefore, in £5 2s. 7¾d. there are 4924 + 3, or 4927 farthings.

The process may be thus arranged :—

```
£5  2s.  7¾d.
 20
───
 100 + 2 = 102s.
            12
           ───
          1224 + 7 = 1231d.
                        4
                      ────
                      4924 + 3 = 4927 farthings.
```

Example 2.—In 4927 farthings how many pounds, shillings, pence, and farthings are there?

4927 divided by four gives a quotient 1231, and a remainder 3; hence 4927 farthings are 1231 pence and 3 farthings. 1231 divided by 12 gives a quotient 102, and a remainder 7; hence 1231 pence are 102 shillings and 7 pence. 102 divided by 20 gives a quotient of 5, and a remainder 2; hence 102 shillings are 5 pounds and 2 shillings. Therefore, 4927 farthings are 1231¾ pence, or 102s. 7¾d., or £5 2s. 7¾d.

The operation may be thus arranged :—

```
 4) 4927
    ────
12) 1231 . . . 3f.
    ────
20)  102 . . . 7d.
    ──────────────
     £5  2s.  7¾d.
```

The same method would apply to compound quantities of any other kind.

Hence we get the following

Rule for the Reduction of Compound Quantities.

(1) To reduce quantities in given denominations to equivalent quantities of *lower* denominations.

Multiply the quantity of the highest denomination by that number which it takes of the next lower denomination to make one of the higher; and to the product add the number of quantities of that lower denomination, if there are any. Proceed in like manner with the quantity thus obtained, and those of each successive denomination, until the required denomination is arrived at.

(2) To reduce quantities of given denominations to equivalent quantities of *higher* denominations.

Divide the number of quantities of the given denomination by that number which it takes of quantities of this denomination to make one of the next higher. Proceed in the same manner with this and each successive denomination, until the required denomination is arrived at. The last quotient, with the several remainders, will be the answer required.

Obs.—It is manifest that the correctness of an operation performed in accordance with either of the foregoing rules may be tested by reversing the operation—that is, by reducing the result to the original denomination.

Example 3.—Reduce 52 tons 3 cwt. 1 qr. 25 lb. to pounds.

```
 52  tons.
 20
────
1040 + 3 = 1043 cwt.
              4
           ────
           4172 + 1 = 4173 qrs.
                        28
                     ─────
                     33384
                     8346
                     ──────
                     116844 + 25 = 116869 pounds.
```

Proof of Correctness.

```
        28) 116869 (4173 qrs.
            112
            ───
              48
              28
              ───
              206
              196
              ───
               109
                84
               ───
                25 pounds

         4) 4173
            ────
       20) 1043 . . . 1 qr.
           ────
          52 tons 3 cwt. 1 qr. 25 lb.
```

Hence the process has been correctly performed.

Exercise 52.

Work the following examples in reduction, bringing each quantity, whether simple or compound, to the denomination or denominations required :—

1. £7 10s. 6d. to pence.
2. £71 13s. 6¼d. to farthings.
3. £90 7s. 8d. to farthings.
4. £295 18s. 3¼d. to farthings.
5. 95 guineas 17s. 9¾d. to farthings.
6. 24651 farthings to pounds, shillings, etc.
7. 415739 farthings to pounds, shillings, etc.
8. 67256 farthings to guineas, etc.
9. £86 4s. to sixpences and to groats.
10. £75 12s. 6d. to threepences.

11. 29 lb. 7 oz. 3 dwt. to grains.
12. 37 lb. 6 oz. to pennyweights
13. 175 lb. 4 oz. 5 dwt. 7 grs. to grains.
14. 12256 grs to pennyweights, ounces, etc.
15. 42672 dwt. to ounces and pounds.
16. 15 cwt. 3 qrs. 21 lb. to pounds.
17. 17 tons 12 cwt. 2 qrs. to ounces.
18. 52 tons 3 cwt. 1 qr. 25 lb. to pounds
19. 140 tons 17 cwt. 3 qrs. 27 lb. to drams.
20. 16256 oz. to hundredweights, etc.
21. 267235 lb. to stones, quarters, hundredweights, etc.
22. 568728 drams to tons, pounds, etc.
23. 95 lb. (apothecaries' weight) to drams, etc.
24. 130 lb. 7 oz. to scruples and to grains.
25. 6237 drams (apothecaries' weight) to pounds, etc.
26. 25463 scruples to ounces, pounds, etc.
27. 27 miles to yards, to feet, and to inches.
28. 45 leagues to feet and inches
29. 3000 miles to perches and to yards
30. 290375 feet to furlongs and miles
31. 1875343 inches to miles, and also to leagues.
32. 15 m. 5 fur. 31 r to rods and to yards.
33 1081080 inches to yards, furlongs, and miles.
34. The earth's circumference (25,000 miles) to feet.
35. 160 yards to nails and quarters.
36 1000 English ells to quarters and yards.
37. 102345 nails to yards, etc
38. 223267 nails to French ells.
39. 634 yds. 3 qrs. to nails and to inches
40. 12256 pints to barrels of 30 gallons.
41. 475262 quarterns to gallons.
42 50 tuns of 250 gallons each to pints
43. 45 pipes of 120 gallons each to pints.
44. 25264 pints to barrels of 30 gallons each
45. 136256 quarts to hogsheads of 63 gallons each.
46. 45 hogsheads 10 gallons to pints.
47. 15 bushels 1 peck to quarts
48. 763 bushels 3 pecks to quarts.
49. 56 quarters 5 bushels to pints.
50. 45672 quarts to bushels, etc.
51. 260200 pints to quarts, pecks, etc.
52. 25 days 6 hours to minutes, and also to seconds.
53 365 days 6 hours to seconds.
54. 847125 minutes to weeks, etc., and to days, etc.
55. 5623480 seconds to days, etc.
56. A solar year to seconds.
57. 30 Julian years to seconds.
58. The time from 9 o'clock a.m. Jan. 2, to 11 p.m. March 1, 1868, to seconds.
59. 110 days 20 minutes to seconds.
60. 27½ degrees to seconds.
61. 7654314 seconds to degrees, etc.
62. 1000000000 minutes to right angles, degrees, etc.
63. 1728 sq. rods 23 sq. yds 5 sq. ft. to square feet.
64. 100 acres 37 sq rods to square feet and to square inches.
65. 832590 sq. rods to square inches.
66. 25363896 sq. feet to acres, etc.
67. 150 cubic feet to cubic inches.
68. 97 cubic yards 15 cubic feet to cubic inches.
69. 49 cubic yds 23 cubic ft to cubic inches.
70. 84673 cubic inches to cubic feet.
71. 39216 cubic feet to cubic yards.
72. 65 loads of rough timber to cubic inches.
73. 4562100 cubic inches to tons of hewn timber.
74. 700 lb. of silver to pounds, etc., avoirdupois.
75. 840 lb. 6 oz. 10 dwt. to pounds, etc., avoirdupois.
76. 1000 lb. Troy to pounds, etc., avoirdupois.
77. 1500 lb. Troy to pounds, etc., avoirdupois.
78. 48 lb. avoirdupois to pounds, etc., Troy.
79. 100 lb. 10 oz. avoirdupois to pounds, etc., Troy.
80. 5656 carats to pounds, etc., avoirdupois.
81. How many sq. yds. in a room 4 yards long and 3 wide?
82. How many sq. ft. in a floor 20 feet long by 18 feet wide?
83. How many acres in a field 50 rods long by 45 wide?
84. How many sq. yds. in a ceiling 35 feet long by 28 wide?
85. How many acres in a field 420 rods long and 170 wide?
86. Find the area of a field 80 rods square.
87. How many yards of carpeting, yard wide, will cover a room 18 feet square?
88. How many yards of painting will cover the four walls of a room 18 feet long, 15 feet wide, and 9 feet high?
89. Find the area of a pitched roof whose rafters are 20 feet and ridge pole 25 feet long.
90. How many cubic feet in a box 5 feet long, 4 wide, and 3 deep?
91. How many cubic inches in a block 65 inches long, 42 wide, and 36 thick?
92. In 10752 cubic feet how many imperial bushels?
93 In 1155 cubic feet 83 inches how many imperial gallons?
94. How many bushels in a bin 5 feet long, 5 wide, and 4 deep?
95. How many cubic feet in a 100-bushel bin?
96. How many yards of carpeting ¾ yard wide will cover a room 25 feet long and 18 feet wide?
97. How many cubic inches in a mass of earth 40 yards long, 5 yards wide, and 8 yards deep?
98. Reduce 93756 cubic yards to inches?
99. How many pieces of paper 12 yards long, and 2 feet 3 inches wide, will it take to cover a room 20 feet long, 16 feet wide, and 18 feet high, allowing for 3 doorways, each measuring 8 feet by 3 feet 9 inches?
100. The moon is about 240000 miles from the earth; if it were possible to go there in a balloon, how many days would it take to accomplish the journey, moving at the rate of 12½ miles per hour?

COMPOUND ADDITION.

3. The process of adding together two or more compound quantities of the same kind is called *Compound Addition.* The method scarcely requires any explanation, and will be understood at once from an example.

£	s	d	far.
6	11	5	1
4	9	6	2
3	12	8	3
8	6	9	1
23	0	5	3

Ex.—Add together £6 11s. 5¼d., £4 9s. 6½d., £3 12s. 8¾d., and £8 6s. 9¼d.

Placing the farthings under the farthings, the pence under the pence, etc., we add the farthings, which amount to 7—*i.e.*, to 1 penny and three farthings. Writing down the 3 farthings under the farthings' column, and adding in the 1 penny to the row of pence, we get 29 pence—*i.e.*, 2 shillings and 5 pence. Writing the 5 pence under the pence column, and adding the 2 shillings to the row of shillings, we get 40 shillings—*i.e.*, 2 pounds exactly. Writing down a cipher under the shillings' column, to show that there are no shillings over, and adding the 2 pounds to the pounds' column, we get 23 pounds, which we write down under the pounds' column.

4. *Rule for Compound Addition.*

Write the quantities so that those of the same denomination stand under each other. Beginning with the lowest denomination, find the sum of each column separately, and divide it by that number which is required to make one of the next highest denomination. Set the remainder under the column added, and carry the quotient to the next column.

Obs.—In the example given above we expressed the farthings in a separate column for clearness, and not as fractions of a penny, but it is not usual to do so.

EXERCISE 53.

1. Add together the following examples in Compound Addition :—

1. £3 17s. 0¼d , £12 5s. 10½d , £2 0s. 5¾d.
2. £4 19s. 11½d., £15 14s. 3¼d., £21 17s. 2d., £57 13s. 9d., 16s. 0¼d., £1 2s. 3½d.
3. £22 8s. 5½d., £18 2s. 0¾d., £38 14s. 9¾d., £23 19s. 10¾d.
4. £987 17s. 10½d., £896 16s. 11¼d., £774 12s. 10¾d., £916 18s. 9½d., £768 15s. 6¼d.
5. £4736 16s. 11¾d., £9804 11s. 10½d., £3896 12s. 6¼d., £7925 17s. 11½d., £8730 12s. 10¾d., £4918 15s. 7¼d., £7835 16s. 9½d., £9768 17s. 10¼d.

6.

tons.	cwt.	lb.	oz.
3	5	17	13
4	7	35	12
1	15	63	7

7.

tons.	cwt.	lb	oz.
15	6	45	5
3	17	80	6
20	0	81	7

8.

lb.	oz.	dwt.	grs.
21	7	12	10
28	5	8	7
7	0	6	15
41	6	0	20
9	0	0	7

9.

leagues.	m.	fur.	rods.	yds.	ft.
5	2	4	7	4	0
18	2	8	21	3	0
85	0	6	10	4	1

10.

acres.	r.	p.
100	3	3
115	2	2
160	1	15
91	2	26

11.

sq. yds.	ft.	in.
15	5	7
10	7	30
9	6	25
7	5	63

12.

gals.	qts.
73	3
60	2
40	1
65	2

13.

wks.	d.	hrs.	min.
10	5	12	40
21	3	9	15
40	4	17	30
42	1	0	0

14.

yrs.	mon.	wks.	d.	hrs.	min.
22	8	2	4	13	29
14	9	3	6	15	2
21	1	0	5	8	59
13	2	2	2	2	37

15.

drams.	scruples.	grains.
2	3	17
5	2	12
3	2	9
5	3	14

16.

cubic yds.	ft.	in.
14	17	1628
728	26	1727
432	13	54
27	2	1111

17.

sq. m	acres.	r.	p.
2	36	3	19
8	27	3	35
4	21	2	21

18.

Fr e.	qr.	nl.
7	4	3
2	3	2
7	1	2
5	0	3

19.

cong.	o.	f℥	fʒ	♏
2	5	15	7	42
5	2	11	3	13
3	7	9	2	11

20.

loads.	qrs.	bush.	pks.	gals.
2	4	7	2	1
3	3	6	3	0
15	2	5	0	1

COMPOUND SUBTRACTION.

5. The process of finding the difference of any two compound quantities of the same kind is called *Compound Subtraction.*

This is performed upon the same principle as simple subtraction—namely, that the difference between any two quantities is not altered by adding the same quantity to each.

Ex.—From £25 9s. 7¼d. subtract £14 17s. 9¾d.

Write the less quantity under the greater, with the corresponding denominations under each other, and express, for clearness, the farthings in a separate column.

£	s.	d.	far.
25	9	7	1
14	17	9	3
10	11	9	2

Three farthings cannot be subtracted from 1 farthing. We therefore add 1 penny, or 4 farthings, to the 1 farthing of the upper quantity, and 1 penny to the 9 pence of the lower quantity. Then 3 farthings subtracted from 5 farthings leave 2 farthings. Again, 10 pence cannot be subtracted from 7 pence. We therefore add 1 shilling, or 12 pence, to the 7 pence of the upper quantity, and 1 shilling to the 17 shillings of the lower quantity. Then 10 pence subtracted from 19 pence leave 9 pence. Again, 18 shillings cannot be subtracted from 9 shillings. We therefore add 1 pound, or 20 shillings, to the 9 shillings of the upper quantity, and 1 pound to the 14 pounds of the lower quantity. Then 18 shillings subtracted from 29 shillings leave 11 shillings; and 15 pounds subtracted from 25 pounds leave 10 pounds.

£	s.	d.	far.
25	29	19	5
15	18	10	3
10	11	9	2

We have, in fact, subtracted the less of the annexed two quantities from the greater, and they are obtained by adding (as it will be found by examination we have done) £1 1s. 1d. to each of the quantities originally given.

Hence we get the following

6. *Rule for Compound Subtraction.*

Write the less quantity under the greater, so that the same denominations stand beneath each other. Beginning with the lowest denomination, subtract the number in each denomination of the lower line from that above it, and set down the remainder below. When a number in the lower line is greater than that of the same denomination in the upper, add one of the next highest denomination to the number in the upper line. Subtract as before, and carry one to the next denomination in the lower line, as in simple subtraction.

7. ADDITIONAL EXAMPLE.

Subtract 75 gals. ? qts. 1 pt. from 82 gals. 2 qts.

gals.	qts.	pts.	
82	2	0	
75	3	1	
6	2	1	Ans.

Here, there being no pints in the upper line to subtract the 1 pint of the lower line from, we add 1 quart—*i.e.*, 2 pints—to the upper line, and the same quantity to the quarts of the lower line. Then 1 pint subtracted from 2 pints leaves 1 pint. 4 quarts cannot be subtracted from 2 quarts. We therefore add 1 gallon—*i.e.*, 4 quarts—to the 2 quarts of the upper line, and 1 gallon to the 75 gallons of the lower. Then 4 quarts subtracted from 6 quarts leave 2 quarts; and 76 gallons subtracted from 82 gallons leave 6 gallons. The operation we have really performed is the subtraction of the less of the subjoined quantities from the greater, and they are obtained from the original two quantities by the addition of 1 gal. 1 qt. to each.

gals.	qts.	pts.	
82	6	2	
76	4	1	
6	2	1	Ans.

Exercise 54.

Find the difference of—

1. £48 17s 6½d. and £37 14s. 9¾d.
2. £1000 and (£500 0s. 7½d. + £496 7s. 6d.)
3. 16 cwt. 3 qrs. 15 lb. and 8 cwt. 2 qrs. 8 lb. 6 oz.
4. 85 tons 16 cwt. 39 lb. and 61 tons 14 cwt. 68 lb.
5. 69 m. 41 r. 12 ft. and 89 m. 10 r. 14 ft.
6. 17 leagues 2 m. 3 fur. 4 r. 4 ft. and 19 leagues 1 m. 2 fur. 15 r.
7. 85 bush. 2 pks. 4 qts. and 49 bush. 3 pks. 6 qts.
8. 115 qrs. 3 bush. 1 pk. and 95 qrs. 4 bush. 3 pks.
9. 85 yds. 1 qr. 2 nls and 29 yds. 2 qrs. 3 nls.
10. 100 yds. and 55 yds. 2 qrs. 1 nl.
11. 140 acres 17 rods and 54 acres 1 rood 18 rods.
12. 465 acres 48 rods and 230 acres 1 rood 30 p.
13. 446 cubic ft. 75 in. and 785 cubic ft. 69 in.
14. 30° 55′ 15″ and 55° 58′ 30″.
15. 71° 10′ and 36° 6′ 30″.
16. 160 yrs. 11 mo. 2 wks. 5 d. 16 h. 30 min. 40 sec. and 106 yrs. 8 mo. 3 wks. 6 d. 13 h. 45 min. 34 sec.
17. How many days from February 22, 1845, to May 21, 1847?
18. How many days from August 25, 1840, to February 6, 1842?

COMPOUND MULTIPLICATION.

8. Multiply £5 2s. 7¾d. by 6.

We may perform the operation as follows:—

	£	s.	d.
3 farthings × 6 is 18 farthings, or	0	0	4½
7 pence × 6 is 42 pence, or	0	3	6
2 shillings × 6 is 12 shillings, or	0	12	0
5 pounds × 6 is 30 pounds, or	30	0	0
The sum of all these is	£30	15	10½

This is the required result, because, in multiplying any quantity by a number, if we multiply separately the parts of which the quantity is composed, and then add the products together, the result is the same as would be obtained by multiplying the whole quantity by that number. The above operation would, in practice, be thus arranged:—

£5	2s.	7¾d.
		6
£30	15s.	10½d.

Hence we see the truth of the following

9. *Rule for Compound Multiplication.*

Multiply each denomination separately, beginning with the lowest, and divide each product by that number which it takes of the denomination multiplied to make one of the next higher. Set down the remainder, and carry the quotient to the next product, as in addition of compound numbers.

Obs.—Any multiplier is of necessity an *abstract* number. Two concrete quantities cannot be multiplied together. Multiplication implies the repetition of some quantity a *certain number of times;* and we see, therefore, that to talk of *multiplying* one concrete quantity by another is nonsense.

In the case of geometrical magnitudes—in finding the area of a rectangle, for instance—we do not *multiply* the feet in one side by those in the other, but we multiply the *number* of feet in one side by the *number* of feet in the other, and from geometrical considerations we are able to show that this process will give us the *number* of square feet which the rectangle contains. The very idea of multiplication implies that the multiplier must be an *abstract* number. It is of the nature of *twice, thrice,* etc. (*Vide* Obs. of Art. 7, lesson IX., Vol. II., page 168.)

10. ADDITIONAL EXAMPLE IN COMPOUND MULTIPLICATION.

Multiply 12 lb. 3 oz. 16 dwt. by 56.

In a case like this, where the multiplier exceeds 12, it is often more convenient to separate it into factors, and to multiply the compound quantity successively by them (Art. 2, lesson III., Vol. I., page 180). Now 56 = 7 × 8.

lb.	oz.	dwt.	
12	3	16	
		7	
86	2	12	
		8	
689	8	16	Answer.

Exercise 55.

Work the following examples in compound multiplication:—

1. £35 6s. 7d. by 7.
2. £1 6s. 8½d. by 18.
3. 1 ton 270½ lb. by 15.
4. 16 tons 3 cwt. 10½ lb. by 25 and 84.
5. 17 dwt. 4½ grs. by 96.
6. 15 gals. 2 qts. 1 pt. by 63 and 126.
7. 175 miles 7 fur. 18 rods by 84, 196, and 96.
8. 40 leagues 2 m. 5 fur. 15 r. by 50, 200, and 385.
9. 149 bush. 12 qts. by 60, 70, 80, and 90.
10. 26 qrs. 7 bush. 3 pks. 5 qts. by 110 and 1008.
11. 150 acres 65 rods by 52, 400, and 3000.
12. 70 yrs. 6 mo. 3 wks. 5 d. by 17, 29, and 36.
13. 265 cubic ft. 10 in. by 93, 496, and 5008.
14. 75° 40′ 21″ by 210, 300, and 528.
15. £213 5s. 6½d. by 819 and 918.
16. 5 tons 15 cwt. 17 lb. 3 oz. by 7, 687, and 708.
17. £13 7s. 9½d. by 1086012 and by 1260108.

(For the last three questions refer to Arts. 15, 16, lesson III., Vol. I., page 183.)

ANTHROPOLOGY.—II.

[Continued from p. 184.]

ZOOLOGICAL ANTHROPOLOGY AND ETHNOLOGY.

Zoological Anthropology.—This subject is or ought to be treated in zoological text-books. Here, however, it may be permissible to sketch very briefly the chief structural differences between man and the lower animals that most nearly resemble him. (1) The ridges above the eyebrows are always coarser and higher in the ape than in man. (2) The sockets, in which the eyes are lodged, and the jaws, are not only smaller in man, but, according to Professor Huxley, they are "situated less in front of, and more below the fore part of the brain-case." (3) The brain is larger and more convoluted in man, and the cerebrum is larger in proportion to the cerebellum in man than in the ape. (4) The volume of the brain is so much greater in the lowest type of man than it is in the highest type of ape, that it creates not merely a specific, but even more than a generic difference between them. Thus, in classifying man zoologically, modern naturalists are reverting to the old ideas of Linnæus. They do not place him in an order by himself. They merely classify him as the only genus and species of the group *Anthropidæ* of the family of the *Catarrhini*, which is a division of the great order *Simiadæ*, to which men and the apes alike zoologically belong.

ETHNOLOGY.—In classifying the different races of mankind, and in tracing the affinities of different branches of humanity on the earth's surface, many methods of research have been adopted. The importance of the brain-case as a test of intellectual development was soon understood. Peter Camper, the Dutchman, proposed to illustrate the comparative development of different regions of the head by measuring the inclinations of two lines bounding those regions. He drew a line from the forehead to the most prominent part of the jawbone. He drew another from the base of the nose to the external ear. The nearer the angle thus formed approached to a right angle, the higher was the intellectual development which it indicated. That was the famous *facial angle* of Camper, and it was reckoned a good test of species, till Jacquart showed (1) that within the population of Paris it varied so much that Camper would have had to group Parisians into distinct species, and (2) that it came very near a right angle in notoriously stupid people. Dr. Barnard Davis (*Thesaurus Craniorum*) arrived at the cubic capacity of the skull by filling it with fine sand of 1·425 specific gravity. The objection to this is, that the results are vitiated by the sand lodging in crevices. Wyman of Harvard used shot, converting the weight of the shot into brain-weight by allowing for the differences in specific gravities between shot and brain-tissue. But for rapid practical work, his plan of measuring instead of weighing the contents of the skull is the best. To convert the cubic contents of the brain-case so measured into brain-weight, you multiply the number of cubic inches by the weight of a cubic inch of water (252·5 grains), and allow 4 per cent. for the difference between the specific gravities of brain-tissue and water.

After Camper came Blumenbach, who was born at Gotha in 1752, and died in 1840. In 1775 he published his celebrated work, "De Generis Humani Varietate Nativa;" in the third edition of which, given to the world in 1795, he subdivides mankind into five varieties, which still hold a place—though not all of them the one he assigned them—in books of ethnology. They are these—the Caucasian, the Mongolian, the Ethiopian, the American, and the Malay varieties.

1. *The Caucasian Variety.*—"Colour white; cheeks rosy; hair brown or chestnut-coloured; head sub-globular (almost globular); face oval, straight, its parts moderately defined; forehead smooth; nose narrow, slightly hooked; mouth small; the primary teeth placed perpendicularly to each jaw; the lips, especially the lower one, moderately open; the chin full and rounded. In general, that kind of appearance which, according to our opinion of symmetry, we consider most handsome and becoming." To this first variety Blumenbach assigns the inhabitants of Europe, excepting the Finns, Laplanders, etc.; also the inhabitants of western Asia as far as the river Obi, the Caspian Sea, and the Ganges. To these, finally, he adds the inhabitants of northern Africa.

2. *The Mongolian Variety* (Fig. 1.)—"Colour yellow; hair black, stiff, straight, and scanty; head almost square; face broad, at the same time flat and depressed, the parts therefore less distinct, and, as it were, running into one another; glabella (meaning the space between the eyebrows) flat and very broad; nose small, apish; cheeks usually globular, prominent outwardly; the opening of the eyelids narrow, linear; chin slightly prominent." To this variety Blumenbach assigns the Turks, Laplanders, and Finns, in Europe; all the Asiatics, except those already mentioned and the Malays; and, finally, the Esquimaux in America.

3. *The Ethiopian Variety.*—"Colour black; hair dark and woolly; head narrow, compressed at the sides; forehead knotty, uneven; malar (cheek) bones protruding outwards; eyes very prominent; nose thick, mixed up, as it were, with the wide jaws; alveolar ridge (meaning the ridge in which

are the sockets of the teeth) narrow, elongated (lengthened) in front, the upper primaries (among the teeth) obliquely prominent; the lips, especially the upper, very puffy; chin retreating. Many are bandy-legged." Under this variety he ranks the inhabitants of Africa, except those of its northern part.

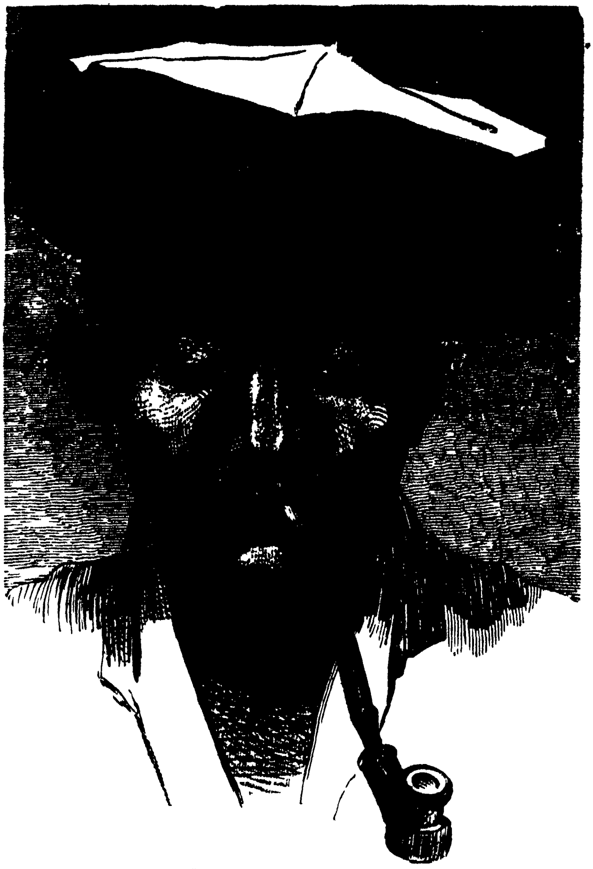


Fig. 1.—Type of the Mongolian Variety.

4. *The American Variety.* — "Copper-coloured; hair black, stiff, straight, and scanty; forehead short; eyes set very deep; nose somewhat apish, but prominent; the face invariably broad, with cheeks prominent, but not flat or depressed; its parts, if seen in profile, very distinct, and, as it were, deeply chiselled; the shape of the forehead and head in many artificially distorted." In this variety Blumenbach includes all the American Indians, but he excludes the Esquimaux.

5. *The Malay Variety.* — "Tawny-coloured; hair black, long, shining, thick, and plentiful; head moderately narrowed; forehead slightly swelling; nose full, rather wide, as it were diffuse, and thick; mouth large; upper jaw somewhat prominent, with the parts of the face, when seen in profile, sufficiently prominent and distinct from each other." To this last variety belong the inhabitants of the Malay peninsula, as also many of the islanders of the Pacific Ocean.

Baron Cuvier reduced Blumenbach's five varieties to three, believing the red men of America and the Malays of the Eastern Archipelago to have sprung originally from the Asiatic Mongolians.

Dr. Prichard, in the third edition of his "Researches into the Physical History of Mankind" (London, 1836), divides the human race:—(1) Iranians, and (2) Turanians (these being the two families designated by Blumenbach Caucasians and Mongolians); (3) Native Americans, excluding the Esquimaux; (4) The Hottentots and Bushmans; (5) the Negroes; (6) the Papuas, or woolly-haired nations of Polynesia; and (7) the Alfourous and Australians. By Alfourous he meant the aborigines of the Malayan Archipelago. In his "Natural History of Man," of which the first edition was published in 1842, and the second in 1845, he modified this arrangement, among other changes dividing the Iranian race into two, for reasons which we shall subsequently explain at length.

Dr. Latham, in his elaborate publication, "The Natural History of the Varieties of Man," given to the world in 1850, introduced new terms, and made his primary divisions Mongolidæ, Atlantidæ, and Japetidæ. Like Cuvier, he placed the Malays and the Native Americans under the Mongolidæ. The Atlantidæ consisted of seven groups—the Hottentots, Negroes, Kaffirs, Abyssinians, and Nubians, connecting by five gradations the Coptic with the Semitic, the Berbers and the Copts, linking the Arabs and the Jews with other African races. The Japetidæ included Europeans and those nations of Asia to which they are most akin.

Philological research was, however, destined to influence the classifications of Prichard and Latham. Halhed, in 1776, and Sir William Jones, somewhat later in the century, were struck by the remarkable fact that Sanscrit—the language of the Brahman sacred books, and which, though nominally dead, still, in a manner, lives on in the modern forms of speech among the Hindoos—was not, as one might have conjectured, akin to Hebrew, Arabic, or other languages of western Asia, but to Greek and Latin. In 1808, Frederick Schlegel, in an "Essay on the Language and Philosophy of the Hindoos," showed that in comparing languages, while resemblances in roots were sought after, it was, above all, important to trace similarity of grammatical forms. Adopting the latter method, he completed the great discovery begun by our countrymen in the East—namely, that Sanscrit, old Persian, Greek, Latin, and German were closely allied. Other tongues have since been proved to belong to the same great assemblage, and quite a flood of light has in consequence been thrown both on European and Asiatic ethnology. Professor Bopp, in 1845, in "A Comparative Grammar of the Sanscrit, Zend,* Greek, Latin, Lithuanian,† Gothic, German, and Sclavonic Languages," showed the close affinity of these seemingly diverse tongues. We take from this work a few words and inflections fitted to make this clear to every reader:—

Eng.	*Sanscrit.*	*Zend.*	*Greek.*	*Latin.*	*Ger.*	*Lith.*	*Old Sclav.*
I give.	dadâmi	dadhâmi	didōmi	do	——	dumi	damy.
I am.	asmi	ahmi	emmi	sum	im	esmi	yesmy.
He is.	asti	ashti	esti	est	ist	esti	yesty.

Here is the present tense of the verb *to be*, as conjugated in the Sanscrit, Greek, Lithuanian, and Sclavonic:—

	SANSCRIT.	GREEK.	LITHUANIAN.	SCLAVONIC.
		Singular.		
1st *Person*	As-mi	em-mi	es-mi	yes-my.
2nd ,,	A-si	es-si	es-si	ye-si.
3rd ,,	As-ti	es-ti	es-ti	yes-ty.
		Dual.		
1st *Person*	S-vas	———	es-wà	yes-va.
2nd ,,	S-thas	es-ton	es-ta	yes-ta.
3rd ,,	S-tas	es-tou	*like the singular.*	yes-ta.
		Plural.		
1st *Person*	S-mas	es-mes	es-mo	yes-my.
2nd ,,	S-tha	es-te	es-te	yes-te.
3rd ,,	S-anti	(s)-enti	*like the singular.*	s-ûty.

The accusative of the first personal pronoun *me* is in Sanscrit *mâm* or *mâ*; in Zend, *manm* or *mâ*; in Greek, *me*; in Latin, *me*; in Gothic, *mik*; in Lithuanian, *manen*; and in old Sclavonian, *mya*. *Thee* is in Sanscrit *tvâm* or *tvâ*; in Zend, *thwanm* or *thwa*; in Greek, *te*; in Latin, *te*; in Gothic, *thuk*; in Lithuanian, *tawen*; and in old Sclavonian, *tya*. Manifestly, the races speaking these different tongues must be closely allied. But may it not be possible to take a step farther? The Gothic may be called the parent of the Germanic tongues. Similarly, may there not, among the closely-allied languages whose names have been given above, be one of great antiquity, from which all the rest sprang? It was once believed that there was, and Sanscrit was assigned this honourable place; but now it is held that the parent language of all the tongues belonging to the family presently under consideration is extinct, and that Sanscrit is no more than the eldest child, or the oldest known descendant of the eldest child. Still, Sanscrit conducts us a great way towards the parent tongue. This can be shown from the remarkable fact that there are words in the European languages which now give no clue to their etymology so long as we confine ourselves to Europe, but of which it is easy to obtain the primitive meaning by turning to Sanscrit. The familiar word *daughter* is an instance in point. Its etymology in English cannot be pointed out. Let us, therefore, turn to other tongues. In old High German the word is *tohtar*; in Gothic, *dauhtar*; in Greek, *thugater*; none of which, so far as we know, give us the information we seek. It is different with the Sanscrit. In that language *daughter* is *duhitri*, which properly signifies *milkmaid*, revealing the interesting fact that in remotely ancient times, before the European and the Brahman had separated from each other, the milking of the cow was the department of household duty which daughters were expected to undertake. It is highly probable, if not even certain, that in primeval times there was a nation in Central Asia, and apparently somewhere on the great Persian table-land, from which came the ancestors of the several European races, and speaking a language from which Sanscrit, Zend, Sclavonian, Greek, Latin, German, and Celtic ultimately sprang. The nations using these diverse tongues were ranged by Blumenbach under his comprehensive division, "Caucasians;" but he associated with them others, which upon the evidence of language have since proved to be totally distinct. We refer to the Arabs, the Jews, the Syrians, the Phœnicians, and sundry allied peoples. It is necessary, therefore, to give these two great sections of the Caucasian race distinctive names. The first is sometimes called the Indo-Germanic, but now more commonly the Indo-European race, the name being designed to express the fact that nations and tribes of mankind belonging to this family are spread over all Europe and Asia as far as India. A shorter and neater term is now generally applied to them — Aryans. The word Arya occurs both in the Hindoo and in the Persian sacred books. There was an old Median tribe, called in Greek ’Αριοι, which in English would be Arians; but that word being used by theologians in quite a different sense, it is more convenient to spell the ethnological term, Aryans. The old name of Persia was Iran, which is from the same root as Arian or Aryan. Hence Prichard, as we have seen, calls the Aryans, Iranians, an appellation which suggests that Persia was their original home. Modifications of the word Aryan have been traced in a multitude of places, and among others in the name of Ireland—*Erin*, and in the *Ire* of Ireland itself.

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* The Zend language was that of the ancient Zoroastrians.

† Lithuania was the old name of a province, forming the east and north-east part of Poland. With the exception of a fragment belonging to Prussia, the whole is now under the sway of the Russian Czar.

The second family of mankind—that which is characterised by "Caucasian" features, but which has no close affinity in language to the Aryans—are best termed the Syro-Arabians, a name which explains itself. They are also often called Semites, as if to suggest that they were all descended from Shem, and that no other races were so. But the Phœnicians, though Canaanites, sprung from Ham, spoke a "Semitic" tongue. There is some reason, moreover, for believing that the Elamites, or inhabitants of Elymais in Persia, though descended from Shem, were of the same race as the ordinary Medes and Persians, in which case they were Aryans. The term Semitic, then, is not strictly accurate. It is almost certain that even the Asiatic part of the Mongolians belong to at least two distinct races. The Chinese language, as we shall afterwards see, is quite unique; and probably, therefore, the Chinese should be separated from the other Mongols, or, as they are now more frequently called, Turanians. Other changes will doubtless be required as investigations go forward.

Scientifically speaking, the principles on which we classify mankind should be identical with those that prevail in classifying other living beings. Of these the chief is, that the value of a character or feature is in direct ratio to its permanence and power of resisting change. Hence physical characters being less subject to change than mental ones, must ever be of most value as a basis for classification. The fatal defect of all systems of classification built on language is that language is of all human characteristics the one that offers least resistance to change. At one time great stress was laid on resemblances in myths, customs, weapons, tools, etc., as clues to racial affinities and kinships. But Mr. Tylor now admits that as a basis for classification such resemblances are not more trustworthy than language. It is a fact that in the same circumstances man is very apt to do the same thing, and fashion the same weapon, regardless altogether of his racial descent. On the other hand, it is also true that much of what he does and makes is the result of hereditary knack and knowledge. The truth, as Mr. Tylor says, is made up of these two factors, though in what proportion we know not.

By far the most ambitious and most natural classification suggested in modern times is that of Professor Huxley. It is based on the character of the hair. All mankind he ranges under two primary divisions—(i.) the *Ulotrichi*, crisp or woolly-haired; and (ii.) the *Leiotrichi*, smooth-haired people. In the Ulotrichi the colour varies from yellow to black, and their skulls are dolichocephalic—*i.e.*, they are longer than they are broad. Negroes, Bushmen, and Malays belong to this negroid stock. The Leiotrichi are subdivided into:—(1) the Australoid group. They are dark-skinned and dark-eyed. They have wavy black hair, long prognallious skulls, with prominent eyebrow ridges. The natives of Australia and the wild hill tribes of the Deccan are the last relics of this stock. (2) The Mongoloid group comprises Chinese, Tartars, Polynesians, Esquimaux, and Red Indians. (3) The Xanthochroic group have pale skins, blue eyes, fair hair; and include Slavs, Teutons, Scandinavians, and fair Celtic-speaking peoples. (4) The Melanochroic group, or dark whites, with pale complexions, black hair and eyes, include Iberians, European dark Celts, all the dark-complexioned natives in the basin of the Mediterranean, Asia Minor, and Persia. This classification certainly explains many curious and otherwise inexplicable racial affinities, *e.g.*, between Negroes, Bushmen, and Malays. By identifying the Australian Blacks with the wild tribes of the Deccan and the ancient Egyptians, it explains the discoveries as to the extraordinary similarity in weapons and implements—*e.g.*, the "boomerang"—in common use among these strangely divergent people; the Egyptians representing the race at the zenith, and the Australian Blacks representing it at the nadir of development. It gives a more plausible explanation of the origin of the dark-whites of the Mediterranean basin and Syria; for they would be hybrids, resulting from the meeting of the oldest of the great human families, the Xanthocroi pushing down from the north, and the Australoids pushing up from the south, and finding in ancient Egypt the final limit of their development.

For practical purposes it may here, however, suffice to take the more familiar classification based on philological affinities as the framework of a popular account of ethnology.

ENGLISH.—X.

[Continued from p. 194.]

PRONOUNS (*continued*).

III. INTERROGATIVE PRONOUNS.

THE interrogative pronouns are *who, what, which, whether, whoever, whatever, whichever.* These pronouns are used in questions, as they refer to an object which is determined in another sentence, the answer. The pronoun *who*, of which *what* is the neuter, undergoes inflections of case, but not of number. The other interrogatives undergo no inflections at all.

We may as well explain at the outset that questions may be divided into two main classes: direct questions and dependent questions. "Who is there?" is a direct question. "He asked who was there" is a dependent question, the clause which contains the question depending on the principal verb in the sentence, *asked.* All the interrogative pronouns may be used in either of these classes of questions.

1. *Who* refers only to persons, and is both masculine and feminine. It is the same for both numbers. It can never be used as an adjective. The genitive and accusative of *who* are *whose* and *whom* respectively. *Whom*, the accusative, can only be used of persons, but *whose*, the genitive, is occasionally found in poetry referring to things. Examples:—

"*Who* could have thought that of him?"
"*Whose* fault was it that the scheme failed?"
"*Whom* did we wrong by our action?"
"He asked in a loud voice *who* went there."

2. *What* is the neuter of *who*, but as an adjective it may refer to masculine and feminine as well as neuter nouns. In the sixteenth century we sometimes find the expression of "What for" in the sense of "What kind of." This is closely paralleled by the German Was für. Example:—

"*What for* a man is he?"

It then means "of what sort," like the Latin *qualis.* As a substantive it is always singular, but as an adjective it may be used with plural nouns. Examples of the use of *what*:—

(*a*) As a neuter substantive:—

"*What* is the matter?"
"He asked *what* we were doing."

(*b*) As an adjective with neuter nouns:—

"*What* sort of person was he?"
"*What* steps did you take?"

(*c*) As an adjective with nouns denoting persons:—

"*What* three people will agree?"
"You ask me *what* Brown is by origin, that his descent should be so displeasing to my father."

Finally, it may be noted that *what*, like *such, many*, etc., may be followed by *an* or *a.* In that case, however, it does not ask a question, but expresses astonishment. Example:—

"*What* a disreputable proceeding!"

3. *Which.*—This interrogative is compounded of *hwa*, the same stem from which *who* is derived, and *lic* (like). It may, therefore, be compared, as far as its formation is concerned, with *such.* It is sometimes used with substantives, sometimes without; it is of all genders, and both singular and plural. It has two distinct meanings, which must be carefully discriminated. It asks which one of several objects is referred to, or the quality of an object. Examples:—

"*Which* man was it?"
"*Which* book are you reading?"
"*Which* is your lieutenant?"
"The captain angrily demanded *which* road the fugitives had taken."

4. *Whether.*—This pronoun means *which of two.* It is generally used as a substantive, rarely as an adjective. It is not inflected either for number or case. Once commonly employed, it has now become obsolete. Example:—

"*Whether* is greater, the gift or the altar?"

5. The compound interrogative pronouns *whoever, whatever, whichever* denote complete uncertainty. Examples:—

"*Whoever* could have done such a thing?"
"*Whatever* was the matter with you yesterday?"

IV. RELATIVE PRONOUNS.

The relative pronouns are, *who, what, which, that, as.* They refer to some noun or pronoun which has been mentioned in the previous sentence, and which is called the antecedent. They serve the double purpose of rendering it unnecessary to repeat the nouns for which they stand, and of connecting two sentences. *Who* and *that* are only used as substantive relatives; *which* is used as an adjective. In old English the only relative was *that;* in the sixteenth century *which* began to be universally used for the relative of all genders. Then a hundred years later, *who*, which had previously been only used as an interrogative, gained the force of a relative. But nowadays all three pronouns, *who, which*, and *that*, are commonly used as relatives. It would be difficult to say what is the difference between them, except that in modern English *which* never refers to persons.

Who the relative, like *who* the interrogative, has the inflected forms, *whose* and *whom*, for the genitive and accusative. Strictly speaking, it should refer only to persons; *whose*, however, may refer to *things* in poetical diction, as in the following example:—

> "Thy brown groves,
> *Whose* shade the dismissed bachelor loves."

And *who* is found in Shakespeare and other authors applied to things—*e.g.:*

> "The first (casket) of gold, *who* this inscription bears"

We append a few examples of the normal use of *who:—*

> "The person *who* had shot him was nowhere to be traced"
>
> "There is a forerunner come from a fifth, the Prince of Morocco, *who* brings word the prince, his master, will be here to-night."
>
> "Brown, *who* had been bred a sailor, gave his powerful and effectual aid in rowing'

In some cases the relative merely connects two clauses; in others it states a reason, and is equivalent to "for he." We give an example of each use —

> "I saw your father, *who* (and he) told me you were going away."
>
> "We were angry with Smith, *who* (because he) had deceived us."

The following peculiarities in the use of *who* should be noted —

(*a*) Sometimes, more especially in the older writers, *who* is equivalent to *he who*—that is to say, the relative has no antecedent expressed. Examples:—

> "*Who* chooseth me shall gain what many men desire."
>
> "*Who* steals my purse steals trash."

(*b*) We sometimes find the personal pronoun repeated after the relative, *who, who he, who him, who his*, standing for *who, whom, whose* respectively. Example:—

> "Who,
> Though bearing misery, I desire my life
> Once more to look on *him*."

The following passage from "The Merchant of Venice" may perhaps be considered an instance of this usage, though it is somewhat difficult to explain:—

> "Who, if he break, thou may'st with better face
> Exact the penalty."

We may either take the words "who, if he break" as meaning nothing more than "and if he break"; or we may regard the *who* as standing for *from whom*.

(*c*) *Who* is found in older writers for *whom*. Example:—

> "*Who* does the wolf love? The lamb."

What is the neuter of *who*, and, though it is quite commonly found as an interrogative pronoun, it is seldom used as a relative. In very early times *which* took its place. However, it is found in older writers, and its normal use does not differ from that of *who*. Examples:—

> "Look, *what* I speak, my life shall prove it true."
>
> "He was barbarously assaulted by many men in the churchyard at Lauervil, at *what* time he would have apprehended a man who denied to appear to justice."

With this you may compare the expression "what time," which is used elliptically for "at what time?" Example:—

> "Two such I saw, *what time* the laboured ox
> In his loose traces from the furrow came."

Similarly, the relative *what* is found instead of "for what" or "why." Example:—

> "*What* shall I need to draw my sword?"

In modern English, when *what* is used, it is almost always a substantive, and has no antecedent expressed. Examples:—

> "Take *what* you like."
>
> "*What's* done can't be undone."

In Shakespeare, *what* sometimes stands for *whatever*, or even *whoever:—*

> "*What* in the world he is
> That names me traitor, villain-like he lies."

Which. In old English, *which* was used with reference to both animate and inanimate antecedents. In modern English, on the other hand, it is only applied to things. Examples of *which* referring to persons:—

> "Our Father, *which* art in heaven."
>
> "She, *which* shall bear a child."
>
> "Then Warwick disannuls great John of Gaunt,
> *Which* did subdue the greatest part of Spain."

This usage is quite obsolete now.

The following are the chief points to be noticed with regard to *which:—*

(*a*) *Which* is generally used as a substantive—that is to say, it stands alone, and does not qualify a noun. Examples:—

> "It is said his enemies appealed to him for justice, *which* they also found on all occasions."
>
> "I shall deliver some traditions concerning him, *which* I have received from good hands."
>
> "I rise from a sick-bed, my dearest Matilda, to communicate the strange and frightful scenes *which* have just passed"

(*b*) Sometimes, however, *which* is used as an adjective or attribute to a noun:—

> "The better part of valour is discretion; in the *which* better part I have saved my life."
>
> "Her father had a house in London and a house in Yorkshire, between *which* places she divided her time."

(*c*) *Which* frequently refers to no definite antecedent, but to the idea contained in a previous sentence:—

> "He had walked twenty-five miles, *which* for him was no inconsiderable feat."

"It delighted him to be taken for a man of learning, *which* he was not."

(*d*) *Which* is found in the poets and in old writers compounded with *the* and *that*. Of this idiom we have already given an instance (*b*). A few more examples, however, will make it clearer to the pupil:—

> "The chain,
> Which God he knows I saw not, for *the which*
> He did arrest me."
> "This abbot *which that* was an holy man."
> "Thy friend *which that* thou hast lorn."

That. In modern English *that* is perhaps more generally used than any other relative. It is applied to persons as well as things, though etymologically speaking it is neuter. The curious history of *that* is summed up by Mr. Morris in his "Historical Outlines of English Accidence," a work which is to be warmly commended to the use of students, as follows:—

"*That* came in during the twelfth century, to supply the place of the indeclinable relative *the*, and in the fourteenth century it is the ordinary relative. In the sixteenth century, *which* often supplies its place; in the seventeenth century, *who* replaces it. About Addison's time, *that* had again come into fashion, and almost driven *which* and *who* out of use. Addison, in his '*Humble Petition of Who and Which*,' makes the petitioners thus complain: 'We are descended of ancient families, and kept up our dignity and honour many years, till the Jack Sprat *that* supplanted us.'"

Examples of the normal use of *that*:—

"He received the libation of scalding liquor with a bowl *that* did little honour to his philosophy."

> "The man *that* hath no music in himself
> Is fit for treasons, stratagems, and spoils."
> "The boy, his clerk,
> *That* took some pains in writing, he begged mine."

The principal archaism in the use of *that* is its usage as an equivalent to *what* or *that which*. This is frequent in the Bible and in Shakespeare, but it is quite obsolete now. Examples:—

> "To do *that* is righteous in Thy sight."
> "And *that* is worse, the Lords of Ross are fled."
> "Throw us *that* you have about you."

As. A word or two must be said here about *as*, for when it follows *such*, *same*, &c., it has a distinct relatival force. Examples:—

"For such men *as* you mention I have no regard."

"He has done the same task *as* I have."

"He had only so much strength left *as* would enable him to crawl home."

Before leaving the relative pronouns we must set before you one or two irregularities to which all of them are subject, especially in archaic or poetic diction.

(*a*) Sometimes the relative is omitted altogether:—

> "I have a brother is condemned to die."
> "You are one of those
> Would have him wed again."

(*b*) A plural relative is sometimes followed by a singular verb. When the relative is some distance from its antecedent this anomaly is intelligible, as the relative undergoes no inflection of number:—

> "'Tis such *fools* as you
> That *makes* the world full of ill-favoured children."
> "Hark, hark, the lark at heaven's gate sings
> And Phœbus 'gins arise,
> His steeds to water at *those springs*
> In chalic'd flowers that *lies*."

(*c*) A relative which refers to a pronoun of the first or second person is sometimes found with a verb in the third person. This irregularity is also to be explained on the ground that the relative has no inflection of person, in consequence of which confusion might readily occur:—

> "To make *me* proud that *jests*."
> "They do but sweetly chide *thee*, who *confounds*
> In singleness the parts that thou should'st bear."

In addition to the relatives we have mentioned, there are the following compound relatives: *whoso*, *whatso*, *whosoever*, *whatsoever*, *whichsoever*. Their use presents no difficulty, and you will easily be able to cull many examples of them from any book you happen to be reading.

EXERCISE 10.

In the following passage you will find many instances of the relative pronouns by which to test your knowledge:—

"We came on our way as far as Dieppe, in Normandy, and there took ship about the beginning of February, when so furious a storm arose, that with very great danger we were at sea all night. The master of our ship lost both the use of his compass and his reason; for not knowing whither he was carried by the tempest, all the help he had was by the lightnings, which, together with thunder, very frequently that night terrified him, yet gave the advantage sometimes to discover whether we were upon our coast, to which he thought, by the course of his glasses, we were near approached; and now towards day we found ourselves, by great providence of God, within view of Dover, to which the master of our ship did make. The men of Dover, rising by times in the morning to see whether any ship were coming towards them, were in great numbers upon the shore, as believing the tempest, which had thrown down barns and trees near the town, might give them the benefit of some wreck, if perchance any ship were driven thitherwards.

"We coming thus in extreme danger straight upon the pier of Dover, which stands out in the sea, our ship was unfortunately split against it; the master said, '*Mes amis, nous sommes perdus*,' or, 'My friends, we are cast away'; when myself, who heard the ship crack against the pier, and then found, by the master's words, it was time for everyone to save themselves if they could, got out of my cabin (though very sea-sick), and, climbing up the mast a little way, drew my sword and flourished it; they at Dover having this sign given them, adventured in a shallop of six oars to relieve us, which, being come with great danger to the side of our ship, I got into it first, with my sword in my hand, and called for Sir

Thomas Lucy, saying that if any man offered to get in before him I would resist him with my sword; whereupon a faithful servant of his, taking Sir Thomas Lucy out of the cabin, who was half dead of sea-sickness, put him into my arms, whom after I had received, I bade the shallop make away for shore, and the rather that I saw another shallop coming to relieve us; when a post from France, who carried letters, finding the ship still rent more and more, adventured to leap from the top of our ship into the shallop, where, falling unfortunately on some of the stronger timber of the boat, and not on the planks, which he must needs have broken, and so sunk us had he fallen upon them, escaped, together with us two, unto the land.

"THE LIFE OF LORD HERBERT OF CHERBURY"

V. INDEFINITE PRONOUNS.

The indefinite pronouns, which do not refer to any before-mentioned person or thing, form a large class by themselves, and we shall now set them before you, with a few examples illustrating the use of each one of them. Some of them are used as substantives, some as adjectives, many of them in either capacity.

Who. It is only in the English of Shakespeare and earlier writers that *who* is used as an indefinite pronoun. Even in the sixteenth century it is chiefly found in this sense in the expression, "as *who* should say," and in modern English it is unknown. Examples:—

"As *who* should say, 'I am Sir Oracle,
And when I ope my lips, let no dog bark'"

"He hath done nothing but frown, as *who* should say, if you will not have me, choose."

What. It has already been pointed out that *what* is the neuter of *who*, and, like the latter, it is used indefinitely. Examples:—

"I love thee not a jar of the clock behind.
What lady—she, her lord?"

"Come down and leave the little *what*
That Thomalin can sayne."

You will notice here that, while the indefinite *who* is only used as a substantive, the indefinite *what* is found both as substantive and adjective, and an instance of each of its uses is given above. The use of *who* as an indefinite pronoun has, as we have stated, altogether disappeared from modern English. But *what* still has an indefinite force in certain expressions, such as *what not*, &c. Examples:—

"Wipes and tickers, and *what not.*"

"I'll tell you *what.*"

Dr. Abbott takes the *what* in the familiar expression, *what with . . . what with*, as an indefinite pronoun; and he is undoubtedly right. He quotes the following passage to illustrate the idiom:—

"And such a flood of greatness fell on you.
What with our help, *what with* the absent king,
What with the injuries of a wanton time."

Here, it will be observed, the meaning of *what with* is *partly*.

One. The indefinite *one* is used as substantive or adjective.

(*a*) As substantive, it is generally quite indefinite. Examples:—

"The little *ones* thoroughly enjoyed themselves."

"I have heard a sonnet begin so to *one's* mistress."

"The sacrifice which he made was no slight *one.*"

But sometimes *one* is applied to a particular individual, especially by an affectation of modesty in the speaker. Example:—

"It was a distressing position for *one* (*i.e.* me) to be in."

Up to the time of Shakespeare we find *one* used to intensify a superlative—*e.g.*, *one*, the wisest prince.

This idiom has been replaced in modern English by *one* with the genitive.

As a substantive, *one* has a genitive *one's*, and a plural *ones*.

(*b*) As an adjective, *one* is used either with a substantive or without. In the latter case it refers of course to a substantive, and is accompanied by a prepositional phrase. Examples:—

"They met *one* day in the meadow."

"*One* John Smith gave damaging evidence."

"His speech was not *one* of bluster, but of genuine enthusiasm."

(*c*) Sometimes *one* is equivalent to *the same.* Example:—

"It's all *one* to me whether I go or stay."

(*d*) *The one* and *the other* are frequently used in opposition to each other. Example:—

"Two women shall be grinding at the mill, *the one* shall be taken, *the other* left."

None, no. The original form of this indefinite pronoun was *none*; *no* is only a weakened form. *No* is used before a substantive; *none* is used absolutely. Thus, in origin and usage, *none* and *no* present an exact parallel to *mine* and *my*. Examples:—

"*None* but the brave deserve the fair."

"Success comes to *none* but to those who wait."

"I will take *no* excuse."

"There are *no* good houses in the town."

None is only found with substantives when it is followed by *other*. Example:—

"Thou shalt have *none* other gods but me."

Some may be used absolutely, referring to a substantive which has already occurred, or it may be used as an adjective.

1. As a substantive:

(*a*) It refers to a noun that has previously been mentioned. Example:—

"*Some* fell upon stony ground."

(*b*) It is followed by a partitive genitive. Example:—

"*Some* of the crew were drowned."

(*c*) *Some* . . . . . . *some*, or *some* . . . . *others* are used just as *alius* . . . . . *alius* in Latin. Examples:—

"*Some* advocated peace, *some* war to the death."
"*Some* were killed, *others* dangerously wounded."

2. As an adjective, *some* has several distinct meanings.

(*a*) It implies complete uncertainty or indefiniteness. Example:—

"*Some* stranger espoused his cause."

To lay greater stress on the uncertainty, the words "*or other*" sometimes follow the substantive qualified by *some*. Example:—

"*Some* friend *or other* is sure to be there."

(*b*) It is used with plural substantives to indicate an indefinite number. Examples:—

"I see *some* folk coming through the slack yonder."
"*Some* men are born great, *some* men achieve greatness, and *some* have greatness thrust upon them."

With this use of *some* we may compare its use with numerals. "*Some twenty*," for instance, means "about twenty."

(*c*) With singular substantives, *some* implies an uncertain or indefinite quantity. Example:—

"The poor man begged us to give him *some* bread to eat."

There are several compounds of *some* which are substantives implying uncertainty.

They are *somebody*, *something*, *someone*, *somewhat*. Examples:—

"*Somebody* was riding at full gallop along the road."
"If you give a man an ill name, he is very likely to do *something* which deserves hanging."
"*Someone* hastened at once to the traveller's assistance."
"I have *somewhat* to say to you."

Any. This indefinite pronoun is very rarely used as a substantive. It is nearly always an adjective, though sometimes it stands alone, the substantive being understood.

(*a*) Examples of *any* as an adjective:—

"He is as successful as *any* man in his profession."
"The sight would have compelled his pity, if he had had *any*."

(*b*) Example of *any* as a substantive:—

"Forgive, if ye have aught against *any*."

The compounds of *any*—*anybody*, *anything*, and *anyone*—are frequently used, but their use presents no difficulty.

Enough. As an adjective, *enough* may precede or follow the noun which it qualifies. Examples:—

"He has *enough* strength of mind to resist the temptation."
"They had money *enough* in their pockets."

As a noun, *enough* is generally neuter, but it is sometimes found applying to persons. Examples:—

"He took *enough* away with him."
"There were not *enough* to form a quorum."

In such expressions as "he was old *enough* to know better," *enough* is an adverb.

Each, *every*. These two indefinite pronouns may be considered together, as *every* is nothing more than a compound of *ever* and *each*.

(*a*) As substantive. Examples:—

"*Each* went his own way."
"One book was given to *each*."

Every, as a substantive, is rare. But the following is found in Shakespeare:—

"*Every* of your wishes."

In poetry, *each* is sometimes equivalent to *both*, sometimes it is used for "each other." Examples:—

"*Each* in her sleep *themselves* so beautify."
"But being both from me, both to *each* friend."

"Both to each friend," means "friends to each other."

(*b*) *Each* and *every* are both used as adjectives. Examples:—

"Take *each* man's censure, but reserve thy judgment."
"He faltered and stammered at *every* other sentence."

Either means *one of two*, and consequently it may be used for "both." It is found as adjective and substantive:—

"Lofty hills rose up on *either* side."
"How happy could I be with *either*."

Other. The meaning of *other* is "the second of two." *The other* is frequently found in opposition to *the one*, as in "*the one* shall be taken, *the other* left." It is used as an adjective as well as a substantive. Example:—

"We travelled hither by the *other* route."

Other has a genitive case, *other's*, as well as a plural form, *others*. Examples:—

"And either drank of *other's* blood."
"Let *others* seek for wisdom's laws
In modern science, modern wit."

In modern English, *other* is generally preceded by one of the articles or *some*. But this was not invariably the case in Shakespeare's time, as the following instance will show:—

"Each time gentler than *other*."

Each other and *one another* are used reciprocally. Examples:—

"They never failed to give *each other* aid."
"Children, love *one another*."

Besides the more important indefinite pronouns to which we have now directed your attention, there remain a few which, though not in every-day use, are often met with in books. These are *sundry*, *divers*, *certain*. Example :—

"Scripture moveth us in *sundry* places."
"We cannot allow this for *divers* weighty reasons"
"A *certain* man had two sons"
"To hunt the boar with *certain* of his friends."

MUSIC.—XI.

[*Continued from p* 197]

TONAL RANGE AND MENTAL EFFECT.

SOME tunes employ only a few tones, while others employ a comparatively great number of tones. The highest and lowest tones of a tune show its TONAL RANGE. The tonal range of Exs. 95 to 100 is from **d** to $\mathbf{d}^1$, or from a tonic to its octave. Exercises on the same plan as these could be constructed with a range from soh_1 to *soh*, or from a dominant to its octave, or from any other tone to its octave. Such exercises the student is strongly recommended to construct for himself. He must, however, be prepared to find new difficulties with each new range. The "outside" tones of a tune, especially when they occur frequently on strongly accented pulses, sensibly temper the mental effects of the tones between. It is necessary, therefore, to study exercises and pieces that exemplify these new associations. The range from dominant to dominant (s_1 to **s**) demands special attention, because it is so frequently employed, and because the strong effect of the dominant exerts a marked influence upon the other scale tones.

The old English tune given below is a beautiful illustration of the dominant range. It may be noticed that the lowest tone is the low *me*, but as this tone comes only on the weak accent it does not materially affect the other tones. As there are several leaps in this melody likely to give trouble, the following preparatory exercises are given.

THE DOMINANT RANGE (s_1 TO s)—DIFFICULT LEAPS (TONIC SOL-FA NOTATION).

Ex. 102.—Doh is G or F. s_1 to **m** and **d** to l_1.

|d :— :d |m :— :d |s_1 :— :d |m :— :—}
|s_1 :— :m |m :— :r |s_1 :m :r |d :— :—}
|s_1 :— :l_1 |l_1 :— :s_1 |d :— :l_1 |l^1 :— :s_1}
|s :m :d |l_1 :t_1 :d |m :r :s_1 |d :— :—||

Ex. 103.—Doh is A or G. **m** to l_1 and l_1 to **r**.

|d :t_1 :d |l_1 :— :s_1 |s :m :d |l_1 :— :s_1}
|m :— :l_1 |l_1 :— :t_1 |r :d :l_1 |l_1 :— :s_1}
|m :r :l_1 |r :— :s |m :r :l_1 |r :— :d}
|d :t_1 :l_1 |s_1 :m :l_1 |r :— :r |d :— :—||

Ex. 104.

GOLDEN SLUMBERS KISS YOUR EYES.

Doh is A♭. *Slowly, Legato.*

p
|s_1 :m_1 :f_1 |s_1 :— :m |r :— :d |l_1 :— :—}
Gold - en slum - bers kiss your eyes,
Care you know not, there - fore sleep,

|s_1 :m_1 :f_1 |s_1 :— :m |r :— :d |r :— :—}
Smiles a - wake you when you rise; }
While I o'er you watch do keep; }

cres *dim.* *p*
|r :m :f |s :f :m |f :m :r |d :t_1 :s_1}
Sleep pret-ty dar - lings, do not cry, And

|d :m :— |l_1 :— :r |s_1 :t_1 :— |d :— :—||
I will sing a lul-la - by.

The round below will afford good practice in part-singing for those who can practise together.

Ex. 105.—Round for four voices.

THE HART HE LOVES THE HIGH WOOD.

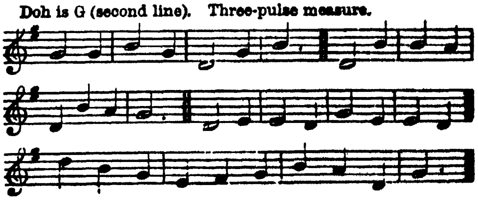
Doh is F.

1 :s_1 |s_1 :s_1 |s_1 :s_1 |d :— |d || 2
The hart he loves the high wood,
2 :d |r :-.m |f :r |m :— |— || 3
The hare he loves the hill,
3 :m |s :s |s :s |s :— |m || 4
The knight he loves his bright sword,
4 :d |f :-.m |r :r |d :— |— || 1
The la - dy loves her will.

THE DOMINANT RANGE—DIFFICULT LEAPS (STAFF NOTATION).

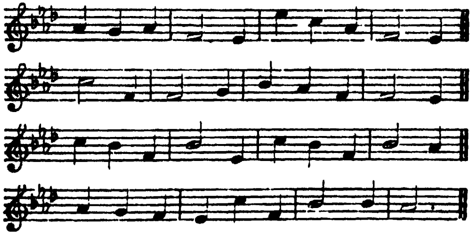
Ex. 102.—Low *soh* up to *me*, and *doh* down to low *lah*.

Doh is G (second line). Three-pulse measure.



Ex. 103.

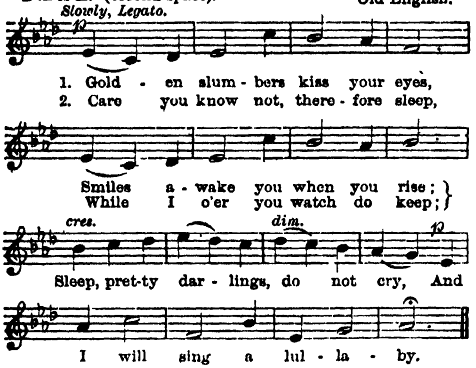
Doh is A♭ (second space). Three-pulse measure.



Ex. 104.

GOLDEN SLUMBERS KISS YOUR EYES.

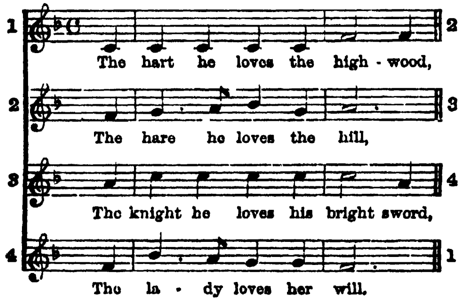
Doh is A♭ (second space). Old English.


Slowly, Legato.
p
1. Gold - en slum - bers kiss your eyes,
2. Care you know not, there - fore sleep,
Smiles a - wake you when you rise; }
While I o'er you watch do keep; }
cres.
dim.
p
Sleep, pret-ty dar - lings, do not cry, And
I will sing a lul - la - by.

Ex. 105.—Round for four voices.

THE HART HE LOVES THE HIGH WOOD.

Doh is F (first space).


1
2
The hart he loves the high - wood,
2
3
The hare he loves the hill,
3
4
The knight he loves his bright sword,
4
1
The la - dy loves her will.

THE FORMATION OF THE SCALE.

The scale hitherto has been presented as a series of effects, and its representation in notation has been explained just sufficiently to enable the singer to know what tones to sing. Before trying to gain further practical skill it is desirable that certain terms and theoretical facts that have an important bearing upon future studies should be fully understood.

SCALE STEPS.—THE WORDS "TONE" AND "NOTE."

On page 32, Vol. I., the scale was shown in the form of a ladder with irregular steps. A reference to the diagram now given will show that *me* and *fah* (or E and F) and *te* and *doh*^{1} (or B and C^1) are nearer than any other two contiguous tones are to one another.

8.	**doh**^{1}	C^1	
			Semitone.
7.	**te**	B	
			Tone.
6.	**lah**	A	
			Tone.
5.	**soh**	G	
			Tone.
4.	**fah**	F	
			Semitone.
3.	**me**	E	
			Tone.
2.	**ray**		
			Tone.
1.	**doh**		

It is one of the misfortunes of musical phraseology that the step from *doh* to *ray* (or from C to D), and all steps of this width, have come to be called TONES; thus using the word *tone* in a sense different from that which it has borne in the previous lessons of this series. This word, in fact, is used (1) to describe the members of the scale, as when "the tone *fah*" is alluded to; (2) to describe the general effect of musical sounds, as when a tone is said to be harsh, sweet, loud, etc.; (3) to describe the distance up or down of one scale member from another, as when *me* or E is said to be "two whole tones" above *doh* or C; and there are even other senses of the word. To add to this confusion, musicians often employ the word *note* in a special sense. Strictly, this word should be applied only to the shapes and signs of musical notation, but, as a matter of fact, it is frequently applied to describe distances, as when a sound is said to be "half a note flat;" and, again, poets and literary men use the word in the strict sense of tone when they write of the "nightingale's note," or of a "note of sadness, joy, or surprise."

d^1	r^1	m^1		C^1	D^1	E^1	
t	d^1	r^1		B	C^1	D^1	
l	t	d^1		A	B	C^1	
s	l	t		G	A	B	
f	s	l		F	G	A	
m	f	s		E	F	G	
r	m	f		D	E	F	
d	r	m	etc.	C	D	E	etc.

KEY OR SCALE.

When the *doh* is set to a certain pitch—say E, for example—the music is said to be in the KEY OF E, and the scale built from this point is called the SCALE OF E. But strictly the word *scale* may be applied to any step-wise succession from a scale-tone to its octave. In this way there may be said to be seven *scales* in every *key*, each one differing from all the rest in the order of tones and semitones.

It is right, however, that the student should know that the words *key* and *scale* as used generally in musical literature have practically synonymous meanings.

MAJOR AND MINOR SCALES.

A scale or key is called MAJOR if the first two steps are whole tones, and MINOR if one of the first two steps is a semitone. Thus the scale from *doh* to *doh*¹ is a major scale, because from *doh* to *me* is two full steps; and the scale from *lah*$_1$ to *lah* is a minor scale, because from *lah*$_1$ to *doh* is one tone and one semitone.

Two tones.

Major scale	d	r	m	f	s	l	t	d^1
	C	D	E	F	G	A	B	C^1
Minor scale	l_1	t_1	d	r	m	f	s	l
	A_1	B_1	C	D	E	F	G	A

Tone and a semitone.

Further explanations as to minor scales will be given later on.

GENERAL NAMES FOR SCALE RELATIONS.

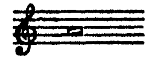
The following terms are in constant use to describe the relations of scale-tones and keys.

	SOH	DOMINANT 5th note *above* the tonic.
	fah	
	ME	MEDIANT. Between the tonic and the dominant.
	RAY	SUPER-TONIC. Just above the tonic.
DOH	DOH	TONIC. The key-note.
te_1	TE_1	LEADING NOTE. A semitone below the tonic, and leading to the tonic.
LAH_1		SUB-MEDIANT. Between the sub-dominant and the tonic; or SUPER-DOMINANT. Just above the dominant.
soh_1		
FAH_1		SUB-DOMINANT. 5th note *below* the tonic.

Although these names are derived partly from the position of *doh* between an over-dominant and an under-dominant, all octaves of the same tones are distinguished by the same terms.

doh¹	Tonic.
te	Leading note.
lah	Sub-mediant, or Super-dominant.
soh	Dominant.
fah	Sub-dominant.
me	Mediant.
ray	Super-tonic.
doh	Tonic.

The note A then may be tonic of key A, super-tonic of key G, mediant of key F, sub-dominant of key E, dominant of key D, sub-mediant of key C, and leading note of key B flat (see page 260).



(TONIC SOL-FA NOTATION.)

The Tonic Sol-faist will find it useful to observe and remember that the steps

me to *fah* and *te* to *doh*¹ are SEMITONES;

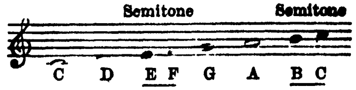
and that the steps

doh to *ray*, *ray* to *me*, *fah* to *soh*, *soh* to *lah*, and *lah* to *te* are WHOLE TONES, or simply TONES.

It is one of the merits claimed for the Tonic Sol-fa notation that in the early stages of practice the pupil is not called upon to concern himself much with these theoretical facts. But a proper picture of the scale should be ever present in the pupil's mind.

(STAFF NOTATION.)

The Staff notationist, unlike the Tonic Sol-faist, is bound to closely study the notational devices used to show the scale-steps from all points of pitch. One of the first things that will strike a thoughtful student is that in representing scale-steps on the staff *no attempt is made to pictorially show the difference between a tone and a semitone.*

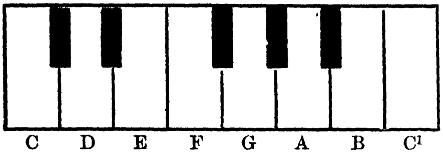


THE NATURAL KEY OR SCALE.

The key-note or *doh* of a piece may be on C, D, etc., at the choice of the composer. But if E to F and B to C¹ are to stand for semitones, it will be at once obvious that the tune of the scale cannot be expressed from any point than C without the assistance of sounds in between some of the tones of the scale of C. Thus, if it is attempted to build a scale from E

C D E F G A B C¹
d * r * m f s * l * t d¹
E F G A B C D E

it will be seen that the F, G, C, and D do not provide the steps of the scale. The scale built upon C is therefore called THE NATURAL KEY or SCALE, because its pitch names express the tune of the scale properly, whereas the tune of the scale from other pitches cannot be expressed without altering one or more of its tones. It must on no account be inferred that the key of C is more "natural" to hear or to sing than any other key. *Keys at all possible pitches are equally natural to the ear and voice.* It is true that many musical instruments are so constructed as to force the player to regard the key of C as a centre, and other keys as departures, but this is simply a convenience for playing and reading. The pianoforte keyboard is a familiar example,



the "white keys" giving the scale of C, whereas at least one white key must be rejected and one black key used to produce the tune of the scale from any other starting-point.

All the notes of the natural key are called NATURAL NOTES. Between any two of those separated by a whole tone a semitone can be performed. These semitones are named from the contiguous natural tone: from that above or below according to circumstances. When a sound is named from below it is said to be a SHARP, and when it is named from above it is said to be a FLAT. The expression "G sharp," then, means a note a semitone *higher* than G natural, and the expression "E flat" means a note a semitone *lower* than E natural.

The following is the sign for a SHARP (♯), and the following is the sign for a FLAT (♭).

All notes are assumed to be natural unless they are expressly said to be sharp or flat. Thus, if a piece is said to be in the key of D, D *natural* is to be understood.

COLUMNS SHOWING THE POSITION OF SHARPS AND FLATS

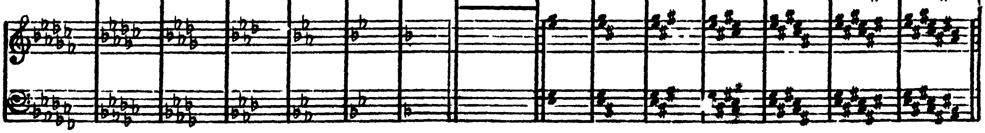
	C¹	(B♯)
C♭	B	
B♭		(A♯)
	A	
A♭		(G♯)
	G	
G♭		(F♯)
	F	(E♯)
(F♭)	E	
E♭		(D♯)
	D	
D♭		(C♯)
	C	

SCALE-BUILDING.

The student should now learn to build scales from all the pitches shown on the columns at the side except those enclosed in brackets, which are *never chosen as dohs* of a scale. The diagram below shows in columns all the scales that are used; those requiring sharps being placed on the right, and those requiring flats being placed on the left. The Sol-fa scale and the natural scale are placed in the middle for comparison. The semitones and whole tones are shown by the spacing.

The order in which the columns follow one another calls for explanation. Each column to the right requires *one more sharp* than the previous column, reckoning from the centre to the right; and each column to the left *one more flat* than the previous column, reckoning from the centre to the

C♭	G♭	D♭	A♭	E♭	B♭	F	C¹ doh	G	D	A	E	B	F♯	C♯
B♭	F	C	G	D	A	E	B te	F♯	C♯	G♯	D♯	A♯	E♯	B♯
A♭	E♭	B♭	F	C	G	D	A lah	E	B	F♯	C♯	G♯	D♯	A♯
G♭	D♭	A♭	E♭	B♭	F	C	G soh	D	A	E	B	F♯	C♯	G♯
F♭	C♭	G♭	D♭	A♭	E♭	B♭	F fah	C	G	D	A	E	B	F♯
E♭	B♭	F	C	G	D	A	E me	B	F♯	C♯	G♯	D♯	A♯	E♯
D♭	A♭	E♭	B♭	F	C	G	D ray	A	E	B	F♯	C♯	G♯	D♯
C♭	G♭	D♭	A♭	E♭	B♭	F	C doh	G	D	A	E	B	F♯	C♯



left. Underneath the columns the sharps or flats called for are gathered together on the staff, with treble and bass clefs in the order of development. When the sharps or flats necessary to the formation of a scale are thus placed together at the beginning of a piece, they make what is called the SIGNATURE of a key.

DRAWING.—XI.

[*Continued from p.* 202.]

FOREGROUNDS—HIGH LIGHTS—SETTING DRAWINGS—FOLIAGE, ETC.

In continuation of our remarks upon foregrounds, we introduce in this lesson a group of dock-leaves. In the drawing (Fig. 108) we have shown how the principles we endeavoured to explain in the last lesson are to be carried out. The leaf in front represents in itself a summary of our observations. Notice the projecting part receiving the highest light; the dark cast shadow underneath being the strongest in the drawing. Notice, also, the cast shadow across the leaf (caused by the one on the left, which throws the under-leaf back, and brings out the one in light), commencing strongly *near the high light*, and gradually becoming lower in tone as it recedes; this, together with the manner of drawing the curved lines on the surfaces of the leaves, tends to give the perspective, and consequently assists in this way to determine the size of the leaf. Examples of this kind can be so easily obtained from Nature that we prefer to leave the pupil to select them for himself, advising him to preserve them for use as we have recommended, and, when drawing from them, to allow his mind to recur to the previous remarks upon the principles we have laid before him, which apply not only to the drawing of a simple weed or dock-leaf, but have their never-failing influence upon all subjects admissible in art. In the drawing of trees and the larger kinds of shrubs we must urge the practice of being particularly careful of the outline, the first process of which must be confined to the general proportions and positions of the *parts in light;* and at the same time, where it is possible, trace by a faint line the course of the stems, which will give additional character and truthfulness. It may not be necessary that these stems should be

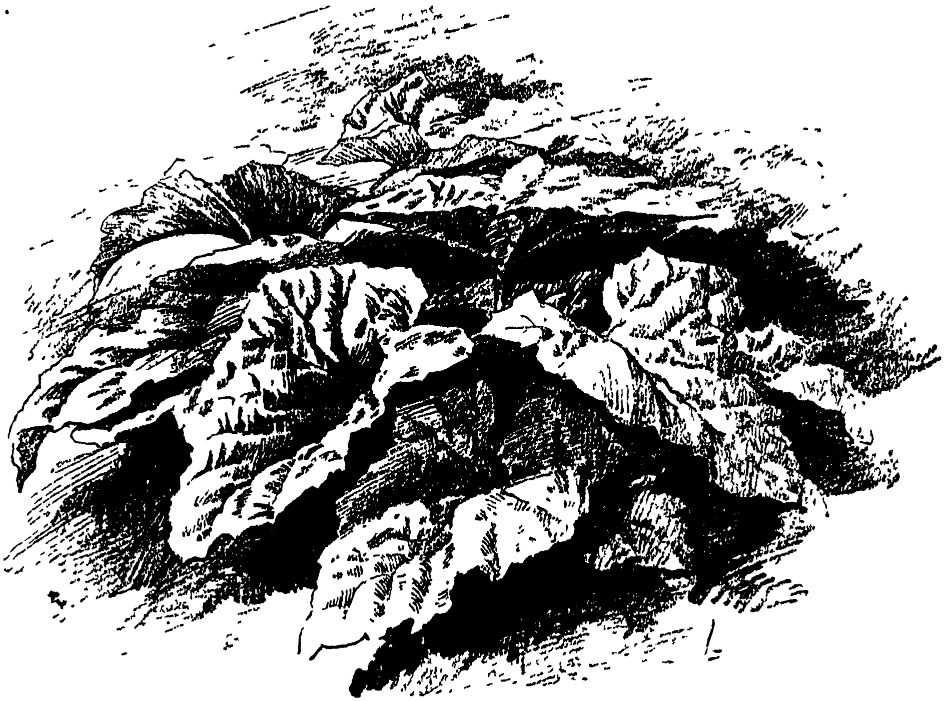


Fig 108.

completed in the finished drawing, as probably their whole extent may not be seen; but the slight indication of their whereabouts may be useful for the purpose of adjusting the foliage according to the class of tree to be represented. This process is to be followed throughout the whole drawing. This, which we will call the first stage, must be done *faintly*, so that with india-rubber—or, what is better for the softer kinds of paper, stale bread-crumbs—these marks may be weakened when the second stage is ready for commencement. In this portion of the work there must be no indecision, particulars must be entered into, especially those upon which the light falls. Amongst these will be found many that owe their prominence to sharp clear terminations; and the distinctness of their forms will be in proportion to the amount of light which falls upon them. The stems previously and slightly traced may now receive in those parts in sight all the forcible and distinctive qualities they demand, even to the peculiarities observable upon the bark. At all times avoid a multiplicity of lines when one only will be sufficient. When we see, as we frequently do in the early attempts of beginners, a number of lines of all lengths and thicknesses muddled together, we can only attribute the practice to doubt and uncertainty; they are waiting to see the effect before they can make up their minds as to the *one right line* required. Such a proceeding indicates weakness and creates confusion. If we were to extend our instructions beyond the single subject of a tree, and include the whole landscape generally, we could only repeat what has been said before, as our remarks are equally applicable to distances and mountains, where it would be a great mistake not to be especially careful in their forms and outlines. These lines must not be strong, but firm and decisive, and the more simple the better; all darker lines must be reserved for the foreground. The method of securing the lights upon trees, which we have shown in Fig. 109, will explain to the pupil the manner of proceeding more clearly than words can do. In his practice we recommend him first to copy parts of the example, and make separate and repeated studies of those portions which, as he

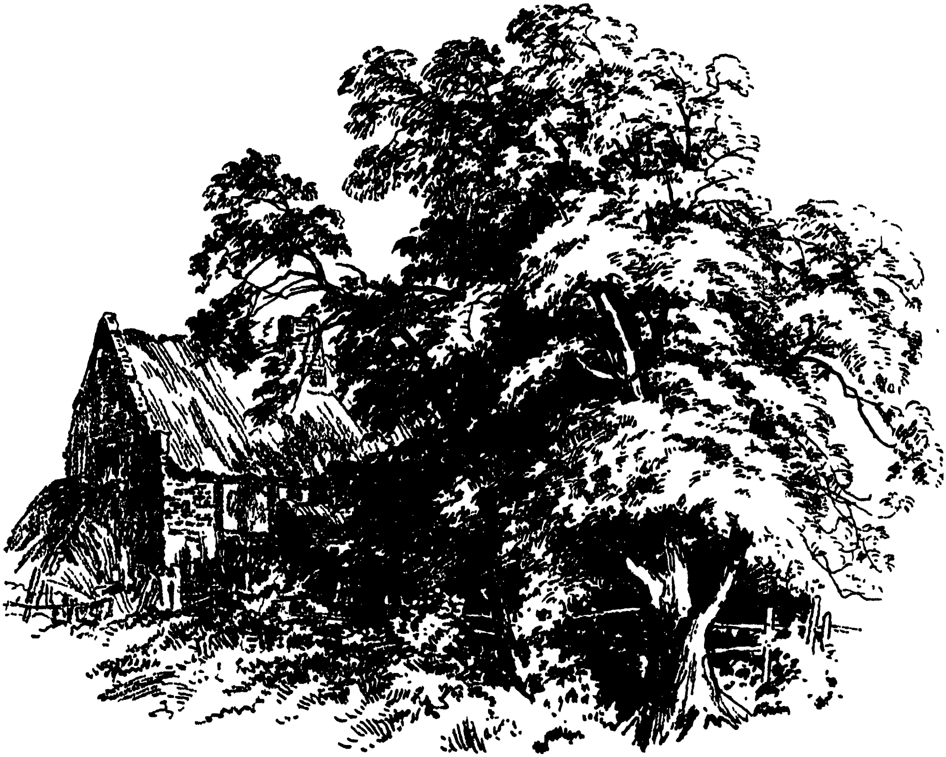


Fig. 109.

proceeds, he finds to be most difficult. He will be better able to decide for himself than we can for him as to which of those parts may require more frequent repetition; and it is almost needless to say that by frequent repetition only can he hope to succeed. There is a very easy and legitimate way of preserving in pencil drawings the sharp touches of light which are seen upon polished surfaces, streaks in water, blades of grass, the bright parts of clouds, small objects of a naturally light colour on a dark background, or any effect where brilliancy is requisite, and where a sharp, clear, and distinct outline of the form must be preserved. It is this:—After the outline of the object, or part to be preserved, has been made, dip a fine hair-pencil into tolerably strong gum-water, and with it cover down the whole of the part intended to be white; when dry, proceed to the completion of the drawing. It will not in the least matter if the lead pencil should pass over the part gummed, it will not have any effect upon it. When the drawing is finished, pin it down at the corners on a board, let it be held in an inclined position, and pour some hot water over it; the gum immediately dissolves, leaving the parts which were covered by it perfectly white. Broad spaces in light, upon which are to be drawn minute and sharply-cut details, may be preserved in this way, and, after the gum is washed off, the details may be made out upon them.

This leads to the use of gum-water in another way, and that is as a means of fixing the drawing. If a drawing is worth anything it surely is worth *setting*—that is, fixing the lead or chalk with which it is drawn so that, under moderate treatment, it cannot injure by rubbing. For highly-finished drawings, or where the chalk or pencil has been very liberally applied, it will be better to proceed in this way:—Nearly fill a shallow dish or tray, somewhat larger than the drawing, with a weak solution of gum-water, or—which may sometimes be more convenient—a mixture of milk and water, half of each; pass the drawing carefully through the mixture (face uppermost) backwards and forwards; then fix it up on the wall by a corner to drip and dry; or the drawing may be pinned down to a board, held on an incline over a dish, and the milk and water poured over it with a spoon, beginning at the top; it is necessary to see that all parts of the drawing have been passed over. If the drawings are merely outlines, or have very little shading upon them, then the fixing medium may be passed over *the whole paper* with a broad flat camel-hair brush. With careful treatment this method of preserving drawings will be found to be quite satisfactory.

We cannot conclude our remarks upon trees and foreground studies without again repeating the importance of gaining a firm decided style in treating such subjects. The drawing must be just as certain here as when the pupil is at work upon a sharply-defined piece of architecture; just as certain, only different in character. Always before beginning work study the *character* of the object to be represented. In every subject there will be one or two salient features, which *make* it, so to speak; be careful to note these points, and draw them first; the details must be added later. Look first in the trees or foreground for the large things:—(1) The proportion; do not let the foliage overbalance the trunk, or the trunk be too thick for the foliage. (2) Look for the values, or masses of light and shade. If the pupil gets the proportion and the values right, he will have a solid groundwork upon which to place the necessary details.

It is such a common habit for a young student, who will take infinite pains over the outline of a house, to begin to draw a tree or a group of leaves in a kind of loose meaningless scribble, that we shall not apologise for having said so much on the necessity of deliberate work.

The drawing of trees and foliage of all kinds is, a most interesting and beautiful study; but it requires as clear an understanding of the subject and as definite a system of work as any other branch of art.

In the case of foliage it is necessary to explain what we mean by *outline*, and how it is to be treated when subject to the various changes caused by sun and shade under which the tree is found. Let us suppose ourselves to be standing opposite a tree on a dull cloudy day. The force of light and depth of shadow will each be less than if the sun were shining upon it, and the half-tints will be more apparent and varied. All round the tree against the grey sky behind there will be the same distinctive and uniform character throughout; but let the sun break out, and then observe what a remarkable change takes place. The general or larger masses of light and shade will be more decided, the neutralising tones among the half-tints will in a great measure have disappeared; the shadow side of the tree will be distinctly made out against the sky, whilst the details in light will be less definite than they were before the sun shone, owing to the radiation of light from the leaves; the half-tints and small shadows in the light will have less strength than they had before—they will be of a warmer tone, and partake of the light and colour around them; the corresponding half-tints on the shadowed side will follow the same course on the same principle—that is, become more general and less distinct in form. We therefore advise the pupil, when "massing in the foliage" of a tree in sunshine, to use his pencil less vigorously on the lights, and not to be betrayed into leaf-drawing and making dark heavy lines. The kind of tree he may be drawing will suggest its own *mode of treatment of the form*, as we have already remarked; but now it is the *strength* and *quantity* of the work we more especially allude to. If the same tree were drawn on a dull heavy day there might be much more *leaf character* introduced both in the lights and in the shades. There is a very common and well-known custom when in difficulties as to the true extent of light and shade; when the pupil is in doubt as to where the light ends and shade begins, let him *half close his eyes* when looking at the object; the minor tones, or those which seem to belong to neither light nor shade, will apparently disappear, and the true extent and force of both extremes become distinct, and so far evident as to enable him to determine their shape and character. Fig. 110 is the general character of a fir-tree, in which we have endeavoured to show how the foregoing instructions are to be observed. Fig. 109 on page 262 will also illustrate our meaning. But the pupil must clearly understand that whilst we advocate a breadth of treatment on the whole, *characteristic* details must not be omitted; these details may be expressed in such a way (without descending to littleness of manner) as not to destroy that breadth, and yet be sufficiently carried out to enable us to say whether the tree be an oak, a poplar, a fir, or one of any other description.

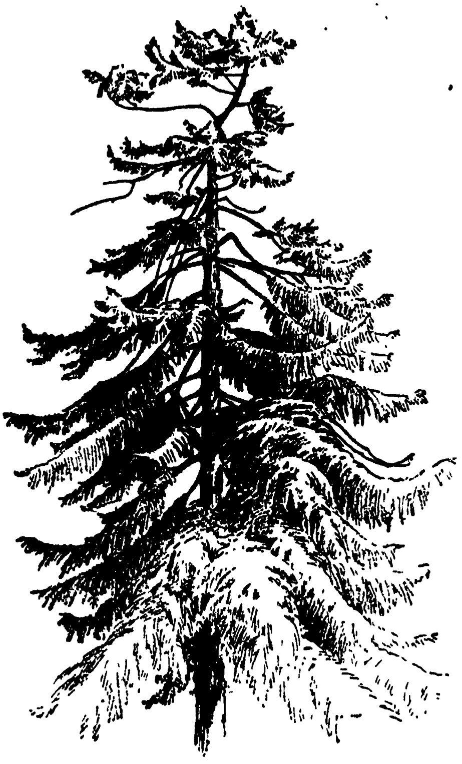


Fig 110

We will now introduce a few practical hints respecting some of the uses to which the knowledge of drawing trees, shrubs, or wild plants may be applied, especially by designers of patterns and ornament. Our country lanes and hedgerows afford abundance of material to supply us with an endless variety of form and culture especially applicable for the decoration of our walls, and for the enrichment of articles of ornament and use. The Corinthian capital is said to have had its origin from the circumstance of a tile having been placed on the top of a basket, around which grew the leaves of the acanthus plant. This, whether true or not, is highly suggestive, and tells us there are beautiful combinations to be found in nature which the designer would do well to cultivate. To point out a few of them will be sufficient to direct the way in which the lover of nature and art may select examples for himself without fearing to exhaust the supply. The most graceful of all the wild plants are those which cling to others for support. Who has not noticed the wild convolvulus, with its elegant elongated leaves, and its simple symmetrical flowers twined about the stem of a brier or hazel? The hop plant, also, the black bryony, and others may be named whose spiral twistings round stems of various kinds produce natural combinations which no mind could suggest, or power of invention could supply. The leaves alone are models for imitation. The ancient Greeks saw this, and proved it by their frequent application of the vine-leaf, the oak, and the ivy. In fact, as Mr. Redgrave has said, "He that would be a great designer must be in the hedgerows and fields at all times, sketching with patient diligence the form and curvatures of leaves, fruits, and flowers, their groupings and foreshortenings; studying them as a whole, and in their minutest details, together with their growth and structure. Not to repeat as a mere imitator, but to display them as ornament; to dispose them geometrically, to arrange them to suit the various fabrics or manufactures for which they may be called on to design, and to give them life and words, as it were, by using them as emblems of some living thought or poetical allusion."

It is the *application* of the graceful forms of the vegetable kingdom that constitutes the most important part of the study of the designer and decorator: the power of drawing, important as it is, is only the means; the *adaptation* is the end sought for. Here it is, we can say with truth, that it requires the mind of an artist to accomplish it, to be imbued with an originality of thought, that can make the simplest object do duty for worthy purposes.

It very frequently occurs that by contrast or application we discover excellences not before observed: respecting the use of this idea, how many times, may we ask, have we trod on the decaying leaf in our pathway, without having had the attention in the least directed to it as capable of suggesting either an original form or a fresh arrangement of colour? However insignificant and valueless an object the fallen leaf may seem to be, it is capable of teaching us a lesson of great practical utility. It has been supposed by some that the shape of the vase owes its origin to a leaf; it may be so or not, but it is sufficient for us to know its capability of suggesting it, and it leads us to where the designer may apply if any new form is required. Such resources, when regulated by a disciplined and scientific taste, must produce something as beautiful as it is original. In search for hints for decorative purposes it is not absolutely necessary to confine our choice to the floral varieties of a conservatory or greenhouse, however valuable they may be for the purpose; the green lanes and hedgerows can boast of gems of form amongst nettles and wild flowers, from which articles of ornament and utility may borrow their simple elegance either to decorate a palace or perform some humble service in a cottager's dwelling. Nature everywhere offers hints that are useful as well as beautiful, and the designer need never sigh for a model. As an illustration of the way in which plants may be adapted to ornament and design, we have introduced one for a candlestick in Fig 111, the socket of which is a lily.

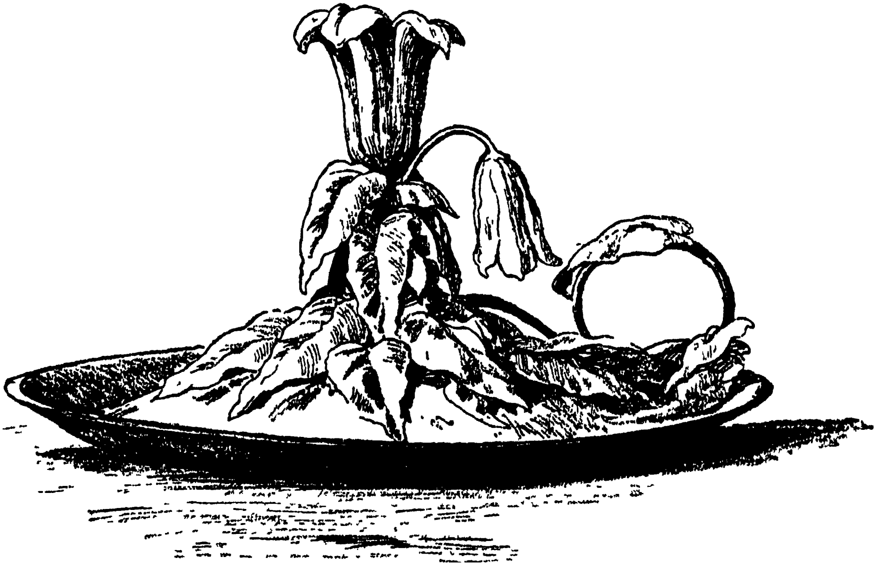


Fig 111.

GEOMETRY.—XI.

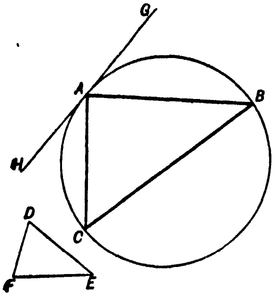
[*Continued from p.* 225]

INSCRIPTION AND CIRCUMSCRIPTION.

A **RECTILINEAL** figure is said to be inscribed in another rectilineal figure when all the angles of the former are on the sides of the latter. A rectilineal figure is inscribed in a circle when all its angles are on the circumference, and a circle is inscribed in a rectilineal figure when its circumference touches all the sides.

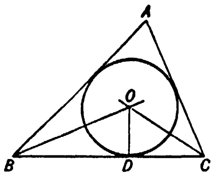
PROBLEM 136.—*In a given circle to inscribe a triangle equiangular to a given triangle.* Let ABC be the given circle and DEF the given triangle.

At any point A in the circumference of the circle draw a tangent G A H to the circle. At A in the straight line G H make the angle B A G equal to the angle D F E and the angle C A H equal to the angle D E F, thus obtaining the chords A B and A C. Complete the triangle A B C by joining B C, and A B C is the triangle inscribed as required.



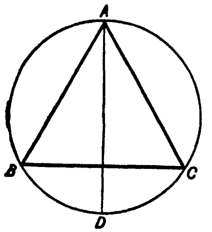
The angle between each chord drawn from A and the tangent finds its equal in the alternate segment of the circle, leaving the third angle B A C of the triangle equal to the angle at D.

PROBLEM 137.—*In a given triangle to inscribe a circle.* Let A B C be the given triangle. Bisect any two of the three angles, say B and C, and let O be the point of intersection of the bisectors. Draw O D at right angles to the side B C, meeting it in D. The circle about the centre O, and having its radius equal to O D, touches the three sides of the given triangle, and is therefore the inscribed circle required.



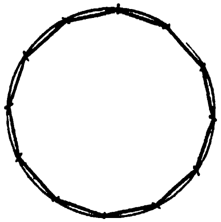
Any point in the bisector B O is equally distant from the sides B A and B C of the angle it bisects, and similarly any point in C O is equally distant from the sides C B and C A. Consequently, O, which is a point on both bisectors, is equally distant from all three sides of the triangle.

PROBLEM 138.—*In a given circle to inscribe a regular or equilateral triangle.* Let A B D C be the given circle. Draw any diameter A D, and from one extremity D with the radius of the circle cut off the equal arcs D B and D C. Join A B, B C, and C A, and the equilateral triangle required is formed.

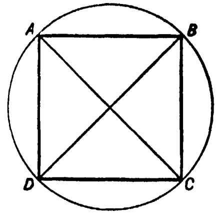


The regular hexagon is inscribed in a circle on the same principle. The first of the next two figures shows the circumference cut into six equal arcs by using a distance equal to the radius, and the formation of the required hexagon by means of the six corresponding chords.

The regular dodecagon has twice as many sides as the regular hexagon, and is readily constructed by cutting off an arc, as in the case of the latter figure, bisecting it, and repeating the chord of the half arc so obtained.



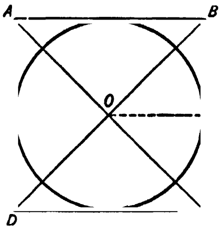
PROBLEM 139.—*In a given circle to inscribe a square or regular quadrilateral.* Let A B C D be the given circle. Draw any two diameters at right angles to each other, dividing the angular magnitude around the centre of the circle into four separate right angles. Join each pair of successive extremities of these diameters by the chords A B, B C, C D, and D A, forming the inscribed square required.



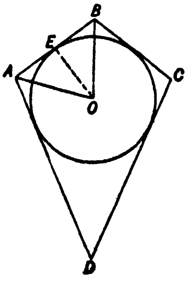
The regular octagon has twice as many sides as the square, and is therefore obtained by the repetition of the chord of an arc which is half the arc subtended by a side of the square.

Bisection of the arc of the octagon enables us to get a regular polygon of 16 sides; further bisection a regular figure of 32 sides, and so on.

PROBLEM 140.—*In a given square or rhombus to inscribe a circle.* Let A B C D be a given square. Instead of bisecting two of the angles, the centre O of the required circle may be obtained more readily by drawing the diagonals A C and B D intersecting in O. The radius of the required circle is the perpendicular distance O E of the centre O from one of the sides, as B C.

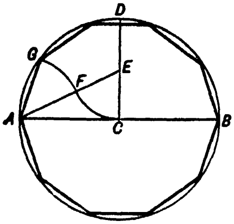


PROBLEM 141.—*In a given trapezium having two pairs of equal adjacent sides to inscribe a circle.* Let A B C D be the given trapezium, having B A equal to B C and D A equal to D C.

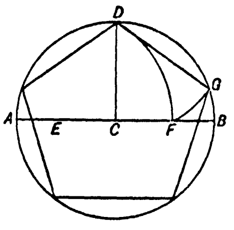


Bisect the angles at A and B, any two of the four angles, and let the bisectors meet in O. O is the centre of the required circle. Its radius is the perpendicular distance O E of the centre O from any one of the sides, say A B.

Problem 142.—*In a given circle to inscribe a regular decagon.* Let A D B be the given circle. Find the centre C, and draw the diameter A B. Draw the radius C D at right angles to A B. Bisect C D in E, and join A E. About the centre E, with radius E C, describe an arc of a circle meeting A E in F, and about the centre A, with radius A F, describe another arc of a circle meeting the circumference of the given circle in G. With the distance A G divide the circumference into equal parts, the number of which will be found to be ten. By joining each point of section to the next, the required decagon is completed.

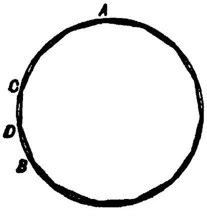


The pentagon may be formed by joining each point on the circumference to the next but one; but it is customary to arrange the construction in the following manner:—E is now the middle point of the radius A C, instead of the radius C D. About E, with the radius E D, an arc of a circle is described, setting off the distance E D in the position E F along the diameter. About the point D as centre, with the radius D F, describe an arc of a circle, meeting the circumference of the given circle in G. With the distance D G divide the circumference into equal parts, the number of which will be found to be five. By joining each point of section to the next in order, the required pentagon will be formed.



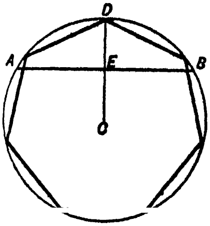
A right-angled triangle D C F, having its sides C F and C D equal to the sides of the inscribed regular decagon and hexagon, has its hypothenuse D F equal to the side of the inscribed regular pentagon.

Problem 143.—*In a given circle to inscribe a regular quindecagon.* Let A C B be the given circle. From any point A on the circumference cut off two arcs, one the arc A B subtended by the side of the inscribed equilateral triangle, and the other the arc A C subtended by the side of the inscribed regular pentagon. Bisect the arc B C, the difference of the two former arcs, in D. Fifteen such arcs as B D or D C make up the whole circumference, and their fifteen chords form the regular quindecagon required.



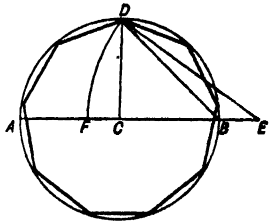
The arc A B is a third of the circumference, and therefore extends to include five sides of the quindecagon; the arc A C is one-fifth of the circumference, and therefore extends to include three sides of the quindecagon; so that the arc B C, the difference of the two former arcs, includes two sides of the quindecagon, and its bisection enables us to get the length of the side of the desired figure.

Problem 144.—*In a given circle to inscribe a regular heptagon.* Let A B D be the given circle. Find the centre C. About any point D on the circumference, and with the radius D C describe arcs of circles cutting the circumference in A and B. Join A B and C D, intersecting in E. By means of the length of E A or E B the circumference may be cut into seven arcs, the chords of which will form approximately the regular heptagon required.



A E is about $\frac{1}{500}$th part short of the true length of the heptagon side.

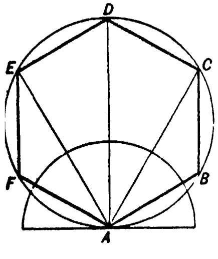
Problem 145.—*In a given circle to inscribe a regular nonagon.* Let A B D be the given circle. Find the centre C. Draw the diameter A B, and the radius C D at right angles to it. From C B produced cut off C E, equal in length to the chord of the quadrant B D, and join E D. About E as centre, with the radius E D, describe an arc of a circle, meeting the diameter in F. With the radius A F divide the circumference into successive parts, and the chords of these arcs will form approximately the regular nonagon required.



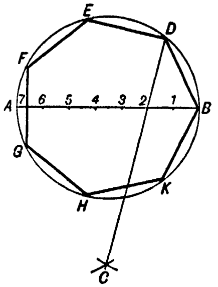
The triangle D C E is contained by sides whose lengths, D C, C E, and E D, are $\sqrt{1}$ (*i.e.*, 1) $\sqrt{2}$ and $\sqrt{3}$, and A F is equal to $\sqrt{1}+\sqrt{2}-\sqrt{3}$.

The approximation in this case is also a close one, A F being only about $\frac{1}{350}$th of the true length of the nonagon side too short.

Problem 146.—*In a given circle to inscribe a regular polygon of any given number of sides.* Let A C E be the given circle, and let it be required to inscribe a regular hexagon. Draw a tangent to the circle at any point A of the circumference. About A as centre, with any convenient radius, describe a semicircular arc terminated by this tangent. Divide the arc into as many equal parts as the polygon is to have sides, in this case six; and from A through the several points of division draw straight lines, meeting the circumference of the given circle in B, C, D, E, and F. Join B C, C D, D E, and E F, completing the inscribed regular hexagon required.



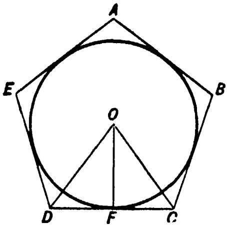
Second method.—Let A K D be the given circle, and let it be required to inscribe a regular heptagon. Find the centre of the circle and draw the diameter A B. Divide A B into as many equal parts as the polygon is to have sides, in this case seven. About the points A and B as centres, with the radius A B, describe arcs of circles meeting in C. From C through the second point of division of the diameter A B draw a straight line, meeting the more distant portion of the circumference in D. With the radius B D cut off from the circumference arcs D E, E F, F G, G H, and H K. Join B D, D E, E F, F G, G H, H K, and K B, forming approximately the regular heptagon required.



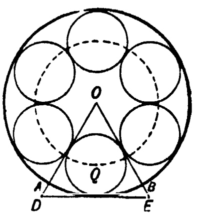
From a purely mathematical point of view this is an extremely interesting problem. It is the result of an effort to find a point, such as C, from which straight lines drawn across the diameter on to the farther portion of the circumference may cut the diameter and the semicircular arc in the same proportion. No one fixed point exactly fulfils this condition for all the various polygons, but there is a movable point, moving within narrow limits, which does. This point moves on the perpendicular from C to the diameter. When so situated that two-thirds of the semicircular arc and two-thirds of the diameter may be cut off, its distance from the diameter is 1·732 times the radius; when two-fourths (a half) of each, 1·752 times; when two-fifths, 1·745 times; when two-sixths, 1·732 times; again, when two-twelfths, 1·672 times; and so on, the distance slowly diminishing down to 1·571 times.

Practically, this problem would only require to be applied to polygons which cannot be formed by exact methods, *i.e.*, to polygons of 7, 9, 11, &c., sides, and the correct distance of the point varies between 1·571 times the radius and 1·719 times. The distance of C, as given in the solution, is measured by the perpendicular of an equilateral triangle C B A, and is equal to $\sqrt{3}$ or 1·732 times the radius. The solution is therefore exact only for the equilateral triangle and the regular hexagon.

PROBLEM 147.—*In any given regular rectilineal figure to inscribe a circle.* Let A B C D E be any regular rectilineal figure, in this case a pentagon. Bisect any two adjacent angles C and D, and let O be the point of intersection of the bisectors. Draw O F the perpendicular from O to D C. About O as centre, with the radius O F, describe a circle, and it will touch each side of the pentagon in succession, as required.



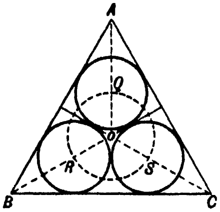
PROBLEM 148.—*Inside a given circle to describe a given number of circles, touching one another and also the circumference of the given circle.* Let the circle having the centre O be the given circle, and, in this example, let it be required to place six smaller circles within the given circle. Divide the circumference into six equal parts of which A B is one. Join O A and O B, and bisect the arc A B in C. Draw a tangent to the circle at C, meeting O A produced in D, and O B produced in E. Inscribe a circle in the triangle O D E (having for its centre Q the point of intersection of O C and the bisector of the angle O D E or O E D). About O, with the radius O Q, describe a circle concentric with the given one. This is the circle of centres, and five other circles of the magnitude of the one inscribed in the triangle O D E may now be described, making six, the number required.



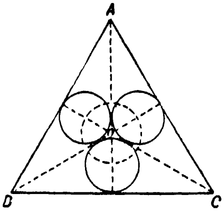
In the case now given, *i.e.*, the case of six small circles being required, the radius of one of the small circles will be found to be exactly one-third of the radius of the given circle, and the radius of the circle of centres exactly two-thirds, and the solution of the problem for this particular case is sometimes arranged accordingly. It may also be mentioned in connection with this case, that a seventh small circle of the same size as the others may be described about the centre O.

PROBLEM 149—*Inside a given equilateral triangle*

to describe three equal circles, touching one another and the perimeter of the given triangle. Let A B C be the given equilateral triangle. Bisect two sides, and let the perpendiculars to the sides at the points of bisection meet in O. In the quadrilateral so formed inscribe a circle, and let Q on O A be its centre. About O, with the radius O Q, describe a circle, meeting the lines joining O B and O C in the respective points R and S; about which points as centres, circles, equal to the one just drawn, may be described. These three circles are the circles required.

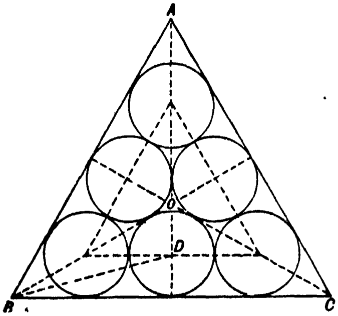


The problem is also satisfied by describing a circle in each of the triangles formed by bisecting the angles of the given triangle, viz., in the triangles O A B, O B C, and O C A; and such a solution is current. Usually, each of the required circles is to be placed in an angle of the given triangle, and not at the middle point of a side.

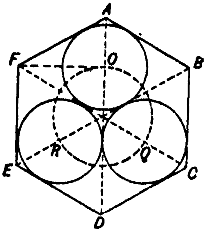


By a similar process to that just detailed, four circles may be described in a square, one in each corner or one at the middle point of each side; five may be described inside a pentagon; six inside a hexagon, and so on.

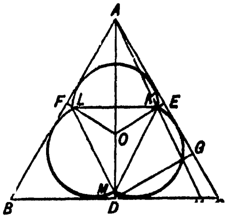
Problem 150.—***Inside a given equilateral triangle to describe six equal circles, touching one another and the perimeter of the given triangle.*** Let A B C be the given equilateral triangle. Draw the three perpendiculars from the angles to the opposite sides, intersecting in O. Bisect one of the half angles so obtained, say, the angle O B C, and let D be the point in which the bisector meets the perpendicular from A. Describe a concentric equilateral triangle, having one side passing through D, parallel to B C. Its perimeter is the line of centres for the six circles required; the radius of each being equal to that portion of the perpendicular from A which is intercepted between D and the side B C.



Problem 151.—***Within a given regular polygon having an even number of sides to describe half that number of equal circles.*** Let A B C D E F be the given regular polygon, having an even number of sides, in this example six. Bisect the angles B and F, and obtain the point of intersection of the bisectors, which is the centre of the polygon. Join the centre and D, completing the division of the polygon into half as many quadrilaterals as the polygon has sides. Produce the lines from B, D, and F through the centre, meeting in each case an angular point on the opposite side of the polygon. Bisect the angle A F O by F O, meeting the central line from A in O, the point about which, as centre, a circle may be inscribed in the quadrilateral. About the centre of the polygon describe a circle, the circumference of which passes through O, and cuts the central lines from C and E in Q and R. O, Q, and R are the centres of the circles to be inscribed in the several quadrilaterals, above mentioned, of the regular polygon.



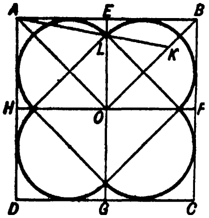
Problem 152.—***Within a given equilateral triangle to describe a trefoil consisting of three semicircles having their diameters adjacent, each semicircle being in contact with two sides of the triangle.*** Let A B C be the given equilateral triangle. Bisect the sides in F, D, and E, and draw perpendiculars to the sides, meeting in O; and dividing the triangle into three equal quadrilaterals, each one forming a corner of the given triangle. Bisect any one of these quadrilaterals, A F O E, by continuing D O to A. Draw D G parallel to O E, and therefore also perpendicular to A C. From D C cut off D H equal to D G. Join A H, cutting O E in K. About O, with radius O K, describe a circle, cutting O F in L and O D in M. Join K L, L M, and M K. On the sides of the equilateral triangle K L M thus formed, describe semicircles, which touch the sides of the given triangle and form the trefoil required.



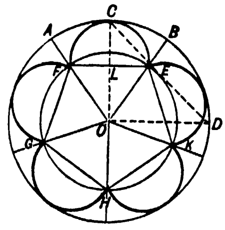
If Q be the middle point of L K and Q N, the perpendicular from Q to the side A C, be drawn, Q N will bear the same ratio to D G that Q K will bear to D H—*i.e.*, Q N and Q K will bear the same ratio to equals, and will therefore be themselves equal.

Problem 153.—***Within a given square to describe a quatrefoil, consisting of four semicircles having***

their diameters adjacent, each semicircle being in contact with two sides of the square. Let A B C D be the given square. Bisect the sides in E, F, G, and H, and draw perpendiculars to the sides, meeting in O, and dividing the square into four equal quadrilaterals or squares, each one forming a corner of the given square. Bisect any one of these quadrilaterals or squares, A H O E, by the semi-diagonal O A, and join O B. From O B cut off O K equal to O E. Join A K, cutting O E in L. About O, with radius O L, cut O F, O G, and O H in three points. Join each of the four points to the next, forming another square, on the sides of which, as diameters, semicircles may be described, forming the quatrefoil required.



PROBLEM 154.—*Within a given circle to describe a foiled figure of any number of lobes, consisting of semicircles having their diameters adjacent to each other.* Let A C B be the given circle. Find centre O, and divide the circle into as many equal sectors as semicircles are required; in this example, say five. Bisect any one of the sectors, A O B, by a radius O C, and draw another radius O D at right angles to O C. Join C D, cutting O B in E. About O, with radius O E, describe another circle concentric with the given one, cutting the bounding radii of the equal sectors in E, F, G, H, and K. Join each of these points to the next, forming a regular pentagon, on the sides of which, as diameters, semicircles may be described, forming the regular foiled figure, in this case the cinquefoil, required.



Let E F intersect O C in L. In the triangle O C D, O C is equal to O D, and therefore in the similar triangle L C E, L C is equal to L E, and a semicircle may be described about L as centre, passing through the points F, C, and E.

BOTANY—I.

INTRODUCTORY—WHAT IS A PLANT?

BOTANY (from the Greek, *βοτάνη*, *bŏtănē*, a plant) is the science of plants. It is concerned with the chemical composition, the internal structure, the external form, the life-history, the functions, the distribution in time and space, the various properties and uses, and the classification, alike of the smallest and most lowly organised fungus or alga and of the infinitely more highly developed—as infinitely larger—fern, pine, palm, or oak. As the science deals with every kind of plant from all these points of view we are at once met by the question—What is a plant? This question is not easily answered with precision. Plants are living beings, and like all living beings, whether animal or vegetable, consist largely of the complex chemical substance known as *protoplasm* (Greek, *πρῶτος*, *prōtŏs*, first; *πλάσμα*, *plasma*, formed) or *sarcode* (Greek, *σαρκώδης*, *sarcōdēs*, fleshy), which contains the elements carbon, hydrogen, oxygen, nitrogen, and sulphur. This substance is essential to the active life of every organism, and during life it generally exists in a state of saturation with water. All the structures of a living being are either formed of protoplasm itself or of material derived from protoplasm; and during life the protoplasm is constantly breaking up into simpler substances, such as carbon dioxide, water, and ammonia, and as constantly repairing itself. Chemically speaking, in fact, life consists in this decomposition and re-composition of protoplasm, and at death the latter process ceases. In composition plants differ from animals mainly in containing a smaller proportion of unaltered protoplasm, and consequently less nitrogen.

In internal structure we find that most animals are mainly built up of minute *cells*, or masses of protoplasm, not enclosed in any definite membrane, and known as *plastids* or *primordial cells.* Though such cells do occur, generally as merely temporary structures, among plants, the vegetable cell is usually of a different character. It consists, in its original condition at least, of protoplasm containing, as do most animal cells, a denser body known as the *nucleus*, but surrounded by a definite membrane, the *cell-wall*, composed of the comparatively simple substance known as *cellulose*, a compound of carbon, hydrogen, and oxygen. Whilst the larger and more highly organised plants are built up of myriads of these cells, variously grouped together in cellular *tissues* or of structures derived from the modifications of cellular tissues, all plants in the first stage of their existence, and some of the lowest plants even when mature, consist only of a single cell. These last are, therefore, known as *unicellular.* These unicellular plants are generally so minute as to be barely visible without the microscope; but are capable of performing all the essential processes of life, such as feeding, breathing, reproducing themselves, and even moving. Motion cannot, in fact, be considered an essentially animal characteristic. In almost any pool of rain-water little green specks may be found which will be seen under the microscope to move rapidly through the water, propelled by two delicate lash-like appendages or *cilia* (Latin, *cilium*, an eye-lash). These specks are unicellular plants known as *Protococcus.* Plants have, however, no complex organs of sensation comparable to the muscles and nerves of the higher animals; so that nearly all their structures may be grouped as nutritive or reproductive.

Among the lowly organisms to which we have referred no known line of demarcation exists between the animal and vegetable world. The green colouring-matter known as *chlorophyll* (Greek, χλωρός, *klōrŏs*, green; φύλλον, *phūllŏn*, a leaf), so general among plants, is not present in all, being absent, for instance, in all Fungi (such as the Moulds, Mildews, Toadstools, and Mushrooms); and it occurs, moreover, in a considerable number of the lower animals.

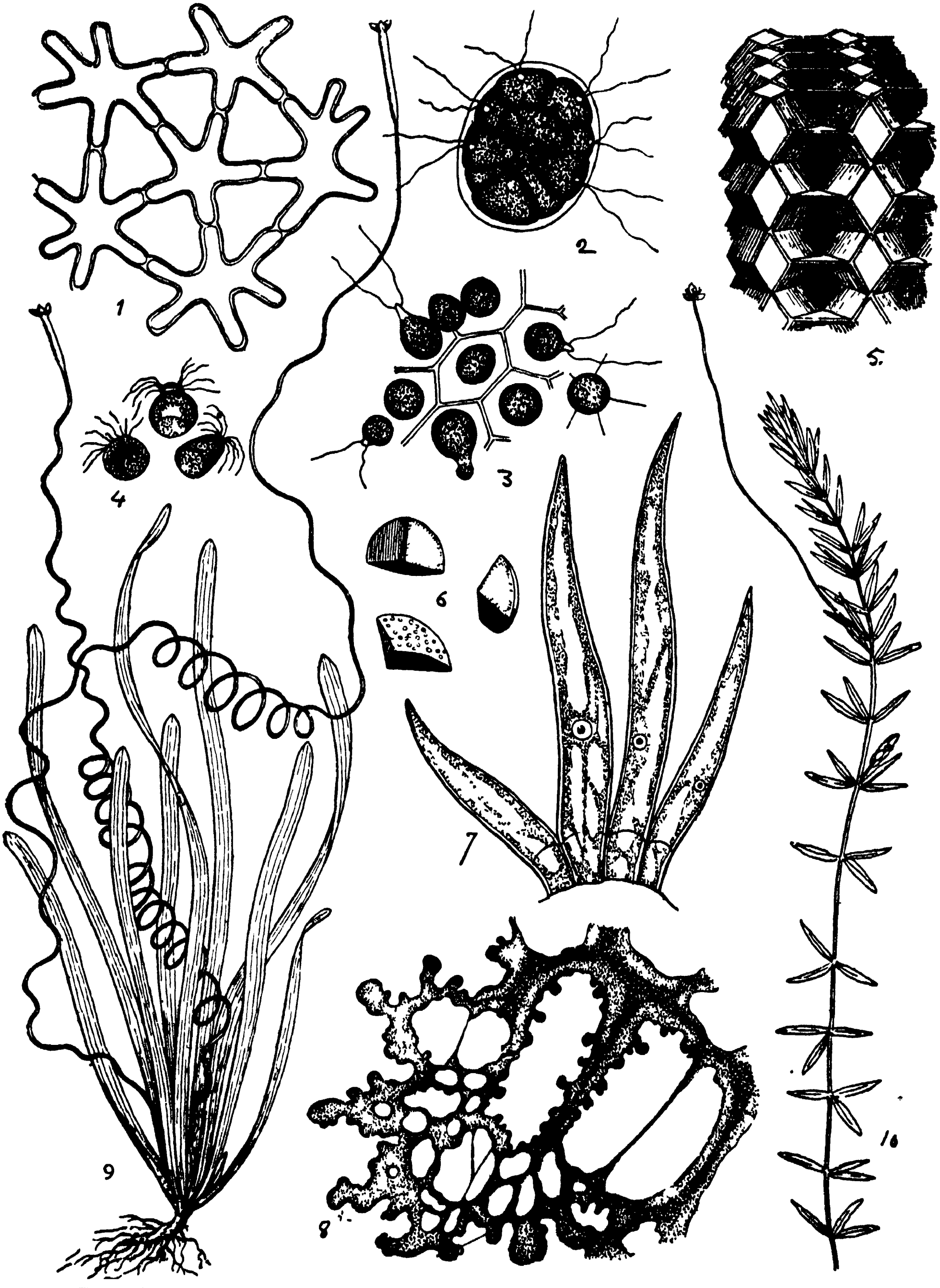
In their breathing, or *respiration*, though plants resemble the more sluggish cold-blooded animals in employing small quantities of gas, there is no essential difference between the two kingdoms, both inhaling oxygen and exhaling carbon dioxide. Green plants, however, in the presence of sunlight, take in large volumes of carbon dioxide and give off proportionately large volumes of oxygen. This action, which occurs also in green animals, is part of the feeding process of the organism, and is not respiratory; but the large volumes of gas involved mask the less marked true respiration.

The character of the food taken in by ordinary green plants presents an apparently marked contrast to that taken in by animals. Such plants obtain liquid food, mainly as water containing various saline substances in solution, from the soil by their roots; and gaseous food, especially carbon dioxide—which is at an early stage in the process also dissolved in water—from the air by their leaves or other green surfaces. They are thus capable of utilising mineral or inorganic matter, which is built up within the plant into organic compounds vastly more complex in their constitution than the substances from which they are formed. The higher animals, on the other hand, though taking in water and perhaps some mineral salts as food, are dependent for the carbon which is essential to their life on compounds already built up by vegetable action. They take solid food into their stomachs, though even in their case it requires in the main to be dissolved before entering the tissues of the body; but, either directly or indirectly, as when it is the flesh of some other animal, all this food must consist of organic compounds. The animal cannot subsist on purely mineral or inorganic substances. This is one of the most decided physiological contrasts between plants and animals; but it must be remembered (i.) that neither the animal nor the Pitcher-plant can truly be said to take in food in a solid form; (ii.) that there are animals which, containing chlorophyll, are capable of assimilating atmospheric carbon; and (iii.) that, on the other hand, there are many plants, including all the Fungi, which do not contain chlorophyll and can only utilise organic compounds—*i.e.*, carbon compounds already assimilated by the agency of other plants. These plants destitute of chlorophyll are either *parasites*, living upon other living organisms, or *saprophytes* (Greek, σαπρὸς, *săprŏs*, rotten; φυτὸν, *phūtŏn*, a plant) growing upon decaying organic matter.

We can thus give only a general answer to the question, What is a plant? A plant is a living being of one or more cells, or partly of structures formed from cells, these cells generally being surrounded by a cellulose wall and containing protoplasm. Plants have not usually the power of motion; usually contain chlorophyll; and subsist mainly upon inorganic food, taken in solution.

The two main aspects from which individual plants can be studied are those of *anatomy* (Greek, ἀνατομή, *ănătŏmē*, dissection), or structure, and *physiology* (Greek, φύσις, *phūsis*, nature), or function. Under the head of anatomy are included both the internal microscopic structure, or *histology* (Greek, ἱστὸς, *hĭstŏs*, a web or tissue), and the external form, the study of which is sometimes called *morphology* (Greek, μορφή, *morphē*, shape). This latter term is, however, more strictly applicable to the study of the laws by which forms correspond to certain types, to *transcendental*, rather than to merely *descriptive* anatomy. Anatomy is also divisible into *general*, that common to various groups, and *special*, that peculiar to one group; and, since all modern systems of classifying plants depend upon structure rather than upon function, the study of classification, or *taxonomy* (Greek, τάξις, *taxis*, arrangement; νόμος, *nŏmŏs*, law), is practically part of that of special anatomy. So also the study of the development of the various parts of the plant, the structural phases which it presents at various stages in its life-history, belongs to anatomy. To physiology, on the other hand, belong the study of the action of various external agencies, such as heat, light, electricity, gravitation, &c., upon living plants, and that of the various vital processes, such as nutrition, growth, movement, and reproduction.

So far as is possible we will consider the functions or uses of its various parts to the plant at the



Figs. 1, Stellate Cells, 2, 3, 4, Ciliated Spores, 5, Dodecahedral Cells; 6, Tetrahedral Cells; 7, Hairs Showing Circulation; 8, A Myxomycete; 9, Vallisneria; 10, Elodea.

same time as we describe its structure, since the one greatly elucidates the other.

The chemical composition of plants and of substances extracted from them belongs more immediately to the science of organic chemistry, their various uses to that of technology, and their distribution in time and space, in part at least, to geology and physical geography, and will, therefore, be but incidentally touched on in these lessons.

To explain examples to which we may refer we may so far anticipate a future lesson as to point out that every plant has two names. The second of these is the *specific* name, or name of the *species*, common to all plants of the same kind, agreeing, that is, in all essentials of structure and form as much as individuals ever do; whilst the first, written with a capital letter, is the *generic* name, or name of the *genus*, a group of species agreeing in all the more important points of structure. Thus *Primula acaulis* is the primrose; *Primula veris*, the cowslip; *Primula sinensis*, the Chinese primrose, &c. In enumerating several species of a genus the generic name may be represented by its initial letter. Thus *Viola odorata* is the violet; *V. tricolor*, the pansy.

HISTOLOGY - THE PLANT CELL.

Some of the simplest plants consist, as we have seen, either of a single cell, or of chains of cells each one of which can lead a separate existence. Higher plants begin life as a single cell, which repeatedly subdivides, forming a *tissue* — *i.e.*, a united mass of similar cells. Parts of this *fundamental tissue* may become altered, or *differentiated*, for particular purposes, so giving rise to a variety of tissues grouped together to form *organs*, such as roots, stems, leaves, seeds, &c.; this increasing complexity of structure being accompanied by a physiological specialisation, or division of labour. Thus if we cut across the flower-stalk of an onion, and examine the section with a magnifying-glass, we shall see a mesh-like or netted chambered structure. If we cut a longitudinal section, we shall observe a similar structure, the meshes being slightly elongated in a vertical direction. This structure was compared by Robert Hooke, in 1667, to a honeycomb, and he first gave to the chambers the name of *cells*. In the flower-stalk of an onion, though the outer cells are different, the central ones are mostly alike. If, however, we examine a section of the bark of a young shoot of the black currant we shall see marked differences between the layers of cells. Externally is a layer, the *epidermis*, the cells of which contain little but air, and have their outside walls much thickened, forming the *cuticle*, so as to resist damp or excessive evaporation ("transpiration") from within. On the epidermis are scattered elongated cells, or *hairs*, and beneath it are several layers of cells—the *hypodermis*, or *primary cortex*—also empty, but strengthened by tough thickening in their angles. Below these, again, are several more regular layers of cork-cells, the *periderm*, which are constantly added to from beneath by the division of rows of cells filled with protoplasm, the *phellogen*, or *cork-cambium*. As the tree gets older, the epidermis, hypodermis, and the outer layers of the periderm may be thrown off as dead cork; but new periderm is constantly forming. The periderm phellogen, and a thin lower layer of cells filled with green colouring-matter, the *phelloderm*, are, therefore, known as *secondary cortex*. Beneath the phelloderm we find a series of layers of long, tough, thick-walled fibres—the *bast*, *liber*, or *inner bark*; so that in this section of bark alone we have six distinct kinds of tissues.

In a typical young cell the cell-wall is thin; it is entirely filled with semi-fluid protoplasm, with the exception of the space occupied by the relatively large nucleus, and the whole cell has a rounded outline.

Cell-form.—Whilst in the soft succulent parts of plants—as in the interior of many leaves—the cells lie loosely together, often with considerable *intercellular spaces*, in denser tissues mutual pressure, freedom from pressure in certain directions, or the stretching of a tissue the cells of which are firmly united, without a corresponding cell-growth, may result in various modifications of cell-form. As a sphere can be in contact with twelve equal spheres, mutual pressure may convert spherical cells into the form known as a *rhombic dodecahedron*—*i.e.*, a twelve-sided body, each face of which is a rhomb. In section such a tissue would appear as a honeycomb of hexagons. Such tissue is common in pith. In the pulp of an orange the cells are drawn out into spindle-shaped bodies, all lying in one direction; whilst in the wood-cells of stems or in the free hairs on the seed of the cotton-plant, we have merely elongation in one direction. The system of intercellular spaces to which the internal tissue of the branches and leaves of rushes owes its capillarity—formerly utilised for conducting melted tallow up the wick of a rush-light candle—is due to the stretching of the cells into twelve-rayed star-like forms, by the growth of the exterior of the organ while the cells remain firmly united at their points of contact. A spherical cell sometimes in dividing forms four tetrahedral cells, with curved bases, as in the spores of some ferns (Figs. 1, 5, 6).

Size of Cells.—In size cells range from ·001 millimetre, the length of some microscopic fungi, to 2 or 3 millimetres, that of wood-cells of fir-trees, those in the pulp of a shaddock, 2 centimetres (four-fifths of an inch) long, or the hairs of cotton, sometimes nearly two inches in length.

Cell-development.—As a cell gets older the wall becomes thicker, the protoplasm becomes "vacuolated—*i.e.*, the watery fluid, known as "cell-sap," with which it is saturated, collects in drops, or "vacuoles"; whilst the nucleus, remaining comparatively unchanged in size while the cell has increased, appears relatively smaller. When mature the cell has its cavity nearly filled with cell-sap, the protoplasm being reduced to a film lining it—known as the *primordial utricle*—and the nucleus being carried with it to the side of the cell. Sometimes the central cavity is crossed by strands of protoplasm. In cells which have in consequence ceased to exhibit any physiological activities or life—such as those of cork or heart-wood—the protoplasm has entirely disappeared, the cell containing nothing but air.

Cell-contents: Protoplasm.—As we have already seen that the contents of a cell are formed before, and are physiologically more important than the wall, we will take them first into consideration. Though not all present in every cell, they may be enumerated as—protoplasm, the nucleus, plastids (including chloroplastids or chlorophyll-granules, leucoplastids, and chromoplastids), starch, inulin, sugars, acids, aleurone-grains, crystalloids, globoids, crystals, cell-sap, resins, tannin, and aromatic substances. Protoplasm, of which the whole of the primordial cell is composed, is essential to the life of the cell—*i.e.*, it is universally present where any true growth is going on. It is gelatinous, more or less granular, almost colourless, mobile, but never perfectly fluid. It is very complex in chemical composition, being undoubtedly not a definite compound, but a variable mixture of albuminoid substances—*i.e.*, compounds of carbon, hydrogen, oxygen, nitrogen, and sulphur—resembling white of egg. The phosphorus which occurs in it belongs chiefly, at least, to the nucleus. Protoplasm is mainly recognisable by its reactions, coagulating at 50° C. or on treatment with alcohol, colouring brown with a solution of iodine, rose-red with concentrated sulphuric acid, and faintly with magenta. It is generally saturated with water; but in ripe seeds or other resting structures is comparatively dry. Though not always divisible, the protoplasm of most cells has a clear outer portion, or *ectoplasm* (Greek *ἐκτὸς*, *ĕktŏs*, without), and a more granular inner portion, or *endoplasm* (Greek *ἔνδον*, *ĕndŏn*, within). The granules in the latter probably consist of "plastic" material—*i.e.*, of assimilated food-matters ready to form new structures—since it has been observed that they are most numerous just before the cell-wall increases in thickness.

Movements of Protoplasm.—Living protoplasm seems generally in a state of movement, the motions it exhibits being of four kinds—*rotatory*, *circulatory*, *ciliary*, and *amœboid*. The two former occur in closed cells, one or other of them perhaps in every living cell, so that they would seem to be essential to the transference of food-materials; whilst the two latter occur only in naked protoplasms (primordial cells). *Rotation* is the revolution of the primordial utricle as a whole, in one direction, along the sides of a cell. It is well seen in many water-plants such as *Vallisneria* (Fig. 10), *Elodea* (Fig. 9), and *Chara*. *Circulation* is the movement of the protoplasm to and from the nucleus along the various strands, and in the primordial utricle. The currents cross one another and are reversed at intervals, and the strands are themselves ruptured from time to time, and re-absorbed into the primordial utricle, or new ones are protruded. Circulation is well seen in the hairs on the calyx of the Hollyhock (*Althæa rosea*), those on young Cucumbers (*Cucurbita*), those on the stamens of the Spiderworts (*Tradescantia*), the stings of Nettles (*Urtica*), etc. *Ciliary motion* is characteristic of many of the reproductive bodies among Cryptogamia being produced by protoplasmic threads, or "cilia," lashing the water, and so propelling the primordial cell with a screw-like movement. *Amœboid motion*—so named from its resemblance to that of Amœba, one of the lowest animals—is confined to an altogether exceptional group of lowly fungoid plants, the Myxomycetes (Fig. 8), in which the protoplasmic mass changes its form and position by an irregular streaming somewhat like the crawling of a slug.

Nucleus.—The nucleus is now recognised as important in the life of the cell. One nucleus at least is perhaps present in all vegetable cells, and its importance is seen in its division generally preceding that of the protoplasm, and in the fact that portions of protoplasm escaping from ruptured cells of some Algæ, such as *Vaucheria*, can reproduce the plant if they contain a nucleus, but not otherwise. Each nucleus originates from the division of a pre-existing one. It is denser than the protoplasm, contains more phosphorus, and is more deeply stained by carmine. It has a tolerably definite limiting membrane (the "nuclear wall"), is generally surrounded by a film of protoplasm, and contains two or more rounded granules known as "nucleoli."

LATIN.—XI.

[*Continued from p.* 221.]

IRREGULAR NOUNS (*continued*).

In addition to the irregular nouns to which we have already called your attention there remain several important classes of anomalous nouns. These are:

1. Nouns which are not of the same gender and form in the plural as in the singular, or which have two plurals, one regular, the other irregular: *e.g.*—

Sing.	*Plur.*
Carbăsus, *canvas* (m.).	**Carbasa.**
Jŏcus, *jest* (m.).	**Joca** (also joci).
Lŏcus, *place* (m.).	**Loca** (loci also occurs, but in the special sense of *places in books* or *topics*).
Sībĭlus, *hiss* (m.).	**Sibila** (also sibili).
Tartărus, *Hell* (m.).	**Tartara.**
Frēnum, *bit* (n.).	**Freni** (also frena).
Rastrum, *harrow* (n.).	**Rastri** (also rastra).

These nouns are called *heterogeneous* in the old grammars.

2. Nouns which are only used in the singular. These are, in Latin as in English, *proper*, *abstract*, *collective*, and *material* nouns. But to this rule there are many exceptions. We may write **duodecim Caesares**, *the twelve Cæsars*, just as we speak of the *four Georges*. Martial writes.—

> Sint Maecenates, non desunt, Flacce, Marones.
> *If there are Maecenases, Flaccus, Maros will not be wanting.*

In this case proper nouns are used to denote individuals belonging to a class, and so have lost their force as proper nouns. For example, the line of Martial we have quoted might be translated: "If there are patrons, there will be poets," and though in this form it would have lost its picturesqueness, its meaning would be unchanged. Abstract and collective nouns may also take a plural in certain cases. Thus an abstract noun which denotes not a state of mind considered generally, but one example of this state of mind, can obviously be regarded as plural—*e.g.*, **amicitiae**, *friendships* — *i.e.*, *several examples of friendship*. Similarly collective nouns may take a plural when more than one "collection" is meant—*e.g.*, **populus**, *people*, **populi**, *peoples*, &c. You have perhaps read in the English lessons that material nouns, though usually regarded as only singular, may, with a shade of difference in their meaning, assume a plural. Thus in English *iron* in the singular denotes all the material *iron* wherever found; but *irons* denotes special objects made of the material iron. Similarly in Latin *aes* means *bronze*, while *aera* denotes artistic objects, bronzes, such as statuettes, &c., cast in bronze.

3. Nouns which are always used in the plural. These are for the most part names of tribes, cities, or mountains, nouns denoting parts of the body, and a few names of persons not regarded separately. In this respect the Latin usage differs but little from the English, and you will find it interesting to compare what we have said here with the discussion of the plural in English on p. 195, Vol. I.

Examples of nouns found in the plural only:—

Luceres, *the Luceres* (a tribe of Romans), **Athenae**, *Athens*, **exta**, *entrails*, **praecordia**, *heart*, **Penates**, *the household gods*, **ethica**, *ethics*. There are still some other nouns used in the plural, which cannot be classified with those already mentioned. Such are:—

Arma, *arms.*
Cūnae, *cradle.*
Dīvitiae, *riches.*
Fasti, *annals.*
Fēriae, *holidays.*
Indūtiae, *truce.*
Insidiae, *ambush.*
Moenia, *town walls.*
Nūgae, *trifles.*
Tĕnĕbrae, *darkness.*

And names of days, festivals: **Kalendae**, *Calends*, **Bacchanalia**, *festival of Bacchus*.

4. Nouns which have one meaning in the singular and another in the plural. We give a list of the principal ones below:—

Sing.	*Plur.*
Aedēs, *temple.*	**Aedes**, *house.*
Aqua, *water.*	**Aquae**, *mineral springs.*
Auxilium, *help.*	**Auxilia**, *allied forces.*
Balneum, *bath.*	**Balneae**, *bathing-house.*
Carcer, *prison.*	**Carceres**, *starting-place* (in games).
Castrum, *fort.*	**Castra**, *camp.*
Cēra, *wax.*	**Cerae**, *waxen tablet.*
Cōpia, *plenty.*	**Copiae**, *forces.*
Fīnis, *end.*	**Fines**, *boundaries.*
Grātia, *favour.*	**Gratiae**, *thanks.*
Hortus, *garden.*	**Horti**, *pleasure-grounds.*
Impĕdīmentum, *hindrance.*	**Impedimenta**, *baggage.*
Littera, *letter of the alphabet.*	**Litterae**, *epistle, literature.*
Lūdus, *play.*	**Ludi**, *public games.*
Nātālis, *birthday.*	**Natales**, *origin.*
Opem (acc.), *help.*	**Opes**, *wealth.*
Opera, *labour.*	**Operae**, *work-people.*
Sāl, *salt.*	**Sāles**, *wit.*
Tăbŭla, *plank.*	**Tabulae**, *writing-tablets.*

5. Nouns which are only partially declined. Of these the chief is **vis**, *strength*, which in the singular has only an accusative *vim*, a genitive *vis*, and an ablative *vi*. In the plural it is declined throughout—*vires*, *virium*, *viribus*, &c.

The following *defective* nouns, as nouns of this class are called, are important:—

	feast, f.	*fruit*, f.	*help*, f.	*prayer*, f.	*change*, f.
N. V.					
Acc.	Dăpem	frūgem	ŏpem	précem	vicem.
Gen.	Dapis	frugis	opis		vicis.
Dat.	Dapi	frugi		preci	
Abl.	Dapĕ	frugĕ	opĕ	precĕ	vicĕ.

These have the full regular plural *-es*, *-um*, *-ibus*, except *vicem*, the gen. plur. of which is *vicium*.

This brings our study of Latin *Accidence* or the *forms* of words to an end. We shall now proceed to *Syntax*, or the rules which govern the *combination* of words in sentences.

TRANSLATION.

The next piece which you will be asked to translate is taken from the "Heroides" of Ovid. This work consists of a number of poetical letters, such as Ovid imagines might have been written by the heroines of classical mythology. In style they are wonderfully simple and graceful, and their simplicity, while it compels the admiration of the critical, renders them easily intelligible to the beginner. We shall give you here the letter which Ovid supposes Dido to have written to Aeneas. It is far too long for you to translate in one lesson. We shall therefore give you piece by piece until you have translated it all. But first you must know something of the writer and recipient of the letter. Aeneas, who was the son of Venus and Anchises, escaped from the ruins of Troy when that ill-fated city was burnt, and spent many years in wandering over the sea. After going through many adventures and seeing many cities, he arrived at Carthage, where the Queen Dido hospitably received him. Here he spent many months, but being reminded by the messenger of Jupiter that it was his destiny to found a great city and establish the Empire of Rome, he determined to leave Carthage. At this resolution Dido was overwhelmed with grief, and the poem which you will now be asked to translate is the letter which Ovid imagines Dido to have written entreating Aeneas to stay:—

"Sic, ubi Fata vocant, udis abjectus in herbis,
Ad vada Macandri concinit albus olor.
Nec, quia te nostra sperem prece posse moveri,
Alloquor: adverso vovimus ista Deo.
Sed merita et famam, corpusque, animumque pudicum
Cum male perdiderim, perdere verba leve est.
Certus es ire tamen, miseramque relinquere Dido:
Atque idem venti vela fidemque ferent.
Certus es, Aenea, cum foedere solvere naves,
Quaeque ubi sint nescis, Itala regna sequi.
Nec nova Carthago, nec te crescentia tangunt
Moenia, nec sceptro tradita summa tuo.
Facta fugis; facienda petis. Quaerenda per orbem
Altera, quaesita est altera terra tibi.
Ut terram invenias, quis eam tibi tradit habendam?
Quis sua non notis arva tenenda dabit?
Alter habendus amor tibi restat, et altera Dido:
Quamque iterum fallas, altera danda fides.
Quando erit, ut condas instar Carthaginis urbem,
Et videas populos altus ab arce tuos?
Omnia ut eveniant, nec te tua vota morentur,
Unde tibi, quae te sic amet, uxor erit?
Aeneas oculis semper vigilantis inhaeret;
Aenean animo noxque diesque refert.
Ille quidem male gratus, et ad mea munera surdus;
Et quo, si non sim stulta, carere velim:
Non tamen Aenean, quamvis male cogitat, odi;
Sed queror infidum, questaque pejus amo.
Parce, Venus, nurui, durumque implectere fratrem,
Frater Amor: castris militet ille tuis.
Fallor; et ista mihi falso jactatur imago.
Matris ab ingenio dissidet ille suae.
Te lapis, et montes, innataque rupibus altis
Robora, te saevae progenuere ferae;
Aut mare, quale vides agitari nunc quoque ventis;
Quo tamen adversis fluctibus ire paras.

NOTES.

1. *Sic* introduces a simile. Dido compares herself, in writing her last letter to Aeneas, to the white swan which, as the fable said, sang before it died.

2. *Maeandri.* The Maeander was a river which took its rise in Phrygia, and was famous for its many windings. From its name our word "meander" is derived.

3. *Nec quia te, &c.* It will help you to translate this line if you notice that the words should be taken in the following order: *Nec alloquor, quia sperem te posse moveri nostra prece.*

Posse moveri. After verbs of saying, thinking, and feeling, the infinitive with the accusative is used to express what is said, thought, or felt. This will be more fully explained to you in the lessons on Syntax.

4. *Adverso vovimus.* "We wished this with God opposed to us." *Adverso Deo* is the ablative absolute, which we have already explained.

5. *Merita.* "My services to thee."

6. *Cum perdiderim.* "When I have thrown away or sacrificed."

7. *Certus es.* "You are resolved."

Dido. This is the accusative. The form *Dido* serves for all the cases except the genitive, which is *Didous.*

9. *Solvere* has a double meaning. *Solvere navem* means to "sail away," *solvere foedus,* "to violate a promise." The play upon this double meaning cannot be rendered by a close translation into English. The following represents its meaning: "You are determined, Aeneas, to break your promise and sail away."

10. *Sint.* A dependent verb, and therefore in the subjunctive.

Sequi. "To go in search of."

11. *Nova Carthago.* Dido was now building the new city of Carthage.

12. *Summa.* "The supreme power."

13. *Facta fugis,* &c. This line will show you exactly the meaning of the past participle and the gerundive. "You fly from what has been done and seek what has to be done," or in other words, "you leave a certainty for an uncertainty."

15. *Ut.* "Supposing that." The use of *ut* and its construction with the subjunctive you will learn in a later lesson. It will be enough to call your attention to it here.

16. *Non notis.* "To strangers."

18. *Quamque iterum.* "And another pledge must be given which you again may break."

21. *Ut.* *See* line 15.

22. *Sic.* "As I love you."

23. *Oculis vigilantis.* "To the eyes of me awake," or more idiomatically, "to my eyes while I am awake."

25. *Ille quidem,* &c. "He, indeed, is ungrateful and deaf to all my kindnesses, and he is one of whom, were I not foolish, I should be glad to be rid."

26. *Et quo.* *Quo* is the ablative after *carere,* a verb of want. Before the relative *quo* you must supply in translating the words, "he is one." The antecedent is often thus omitted in Latin.

28. *Pejus.* "The more." Lit., "the worse."

29. *Fratrem* Aeneas, being the son of Venus, would therefore be the brother of Love.

Nurum. Dido regards herself as the wife of Aeneas, and so the daughter-in-law of Venus.

30. *Castris,* &c. "Let him fight in your camp," or, as we should say, "under your colours."

31. *Falso.* "In vain."

33. The general sense of this and the following lines is, "Venus cannot have been your mother; rocks and waves, or wild beasts, must have produced you."

SYNTAX.

You have hitherto been studying the inflections which Latin words undergo, and it is necessary, if you ever hope to gain proficiency in Latin, to thoroughly master this branch of grammar, or accidence, as it is called. You must now turn your attention to syntax, that branch of grammar which teaches you how the various inflected forms of words are combined and arranged to form sentences. And before going farther, it will be well for you to understand clearly what a sentence is.

THE SENTENCE.

Sentences may be divided into two classes:—(1) the simple sentence; (2) the complex sentence. But first of all we must give you a definition of a sentence. *A sentence is a complete thought expressed: e.g.*—

Puer currit.
The boy runs.

In a *simple sentence* only one thought is expressed: *e.g.*—

Rosa floret.
The rose flourishes.

In a *complex sentence* one principal thought is expressed and one or more dependent or subordinate thoughts: *e.g.*—

Rosa, quae floret, bene olet.
The rose, which flourishes, smells sweetly.

Si tibi mens avida est belli, praebebimus hostem.
If your mind is set upon war, we will provide an enemy.

There is another possible subdivision of sentences: they may be classified according to their meaning. This classification gives us the following:

(1) Affirmations, or *affirmative* sentences: *e.g.*—

Cicero loquitur.
Cicero speaks.

(2) Interrogations, or *interrogative* sentences: *e.g.*—

Quis loquitur?
Who speaks?

(3) Commands, or *imperative* sentences: *e.g.*—

Loquere, puer
Speak, boy.

(4) Wishes, or *optative* sentences: *e.g.*—

Puer sit felix.
May the boy be happy.

THE SIMPLE SENTENCE.

The simple sentence, as we have already stated, must express one complete thought. In Latin a complete thought may be expressed by one word: *e.g.*—

Loquor, *I speak;* Currit, *he runs;*
Veni, *come;* I, *go.*

In English the simplest thought requires two words to express it, with the single exception of commands, which may be expressed in one word. But even when one word expresses a thought, that thought contains two ideas. For it must tell us that a certain thing takes place with regard to some person indicated if not named. Each of the single words we have cited above as instances contain two ideas. *Loquor* means *I speak;* the first person singular is denoted by the termination, the action *speak* by the root syllable. And this, it must be remembered, is the simplest form of a sentence. The majority of sentences contain a noun as well as a verb. The two ideas which every sentence must contain are called the *subject* and the *predicate,* the person or thing concerning which a statement is made being called the subject, and the statement made concerning it being called the predicate. Sometimes the connection between the subject and predicate has to be expressed by a separate word, as otherwise it would not be clear. The word used as a connecting-link is generally some part of the verb **sum,** *to be,* which is called the copula:—

Rex est fortis.
The king is brave.

Fabius erat consul.
Fabius was consul.

In these two sentences *est* and *erat* form a connecting-link, and each of them is known as a copula. To sum up, the subject of a sentence must always be a noun, pronoun, or other word used as a noun, indicated, if not expressed; and the predicate must be a verb, or a noun or adjective with the copula. But the simple sentences may be added to in several ways and yet remain a simple sentence. Such additions are called *complements.*

(1) *Attributes*, or qualifying words, may be added to the subject in order to make the nature or quality of the subject more clear to the reader. These attributes may take the form of

(*a*) An adjective: *e.g.*—

Bonus vir loquitur.
The good man speaks.

(*b*) A noun in apposition: *e.g.*—

Julius consul venit.
Julius the consul came.

(*c*) A noun in the genitive case: *e.g.*—

Vis animi.
Force of mind.

(*d*) A relative sentence: *e.g.*—

Vir, *quem vides*, rex est.
The man, WHOM YOU SEE, *is king.*

This, however, is not a simple sentence, as it contains two ideas.

(2) The predicate may be *completed* or added to in several ways.

(*a*) Transitive verbs require an accusative case after them, that the result of the action of the verb may be expressed. This is called the direct object of the verb: *e.g.*—

Magister *puerum* laudat.
The master praises THE BOY.

(*b*) A noun in the dative case may complete the idea expressed by the verb. This is called the indirect object: *e.g.*—

Pater libros *puero* dedit.
The father gave books TO THE BOY.

(*c*) A verb by itself sometimes expresses an incomplete idea, and requires an adjective or noun to complete its meaning: *e.g.*—

Plato videbatur *sapiens.*
Plato seemed to be WISE.

(*d*) Adverbs and adverbial phrases are also used to complete the idea of the predicate: *e.g.*—

Bis dat, qui *cito* dat.
He gives twice, who gives QUICKLY.

AGREEMENT.

The laws which control the inflections of words in Latin are very strict, and unless the student carefully masters the rules of agreement he will never be on safe ground, and will continually fall into serious errors. We therefore commend the following remarks to the attention of the reader.

Agreement also bears the name of *concord.* Agreement may take place variously, as between

1. A noun and a noun.
2. A noun and a pronoun.
3. A pronoun and a pronoun.
4. A noun and an adjective or a participle.
5. A noun and a verb.
6. A pronoun and a verb.

1. **A noun agrees with a noun**, as—

Tomyris fuit *regina.*
TOMYRIS *was* QUEEN.

Here observe the two nouns are subject and predicate. *Tomyris* is the subject, and *regina* is the predicate, and they are both in the nominative case, singular number, and feminine gender. We may then say, as a general rule, that a noun as predicate agrees with its subject in gender, number, and case. The sentence before us presents an instance of another fact in Latin syntax—namely, that the verb *esse* (with some others) has the same case after it as before it.

Sometimes the predicate, though agreeing in sense with the subject, departs from it in gender alone, or in both gender and number; for example, first as to gender—

Tomyris fuit patriæ *decus;*
TOMYRIS *was* THE HONOUR *of her country;*

where *decus*, though referring to a feminine noun, is in the neuter gender.

In number also the predicate may vary from the subject: for example—

Tomyris fuit *deliciæ* Scytharum.
TOMYRIS *was* THE DELIGHT *of the Scythians.*

A noun, moreover, agrees with a noun when one noun is added to another to explain its meaning or application. This construction is called *apposition* (from ad, *to*, and pono, *I place*), because the second (or third) noun is simply put or subjoined to the first, as—

Tomyris, regina Scytharum, *Cyrum, regem* Persarum, devicit.
TOMYRIS, THE QUEEN *of the Scythians, conquered* CYRUS, THE KING *of the Persians.*

Observe that *regina*, being in apposition with *Tomyris*, agrees with it in gender, number, and case. The same relation exists between *Cyrum* and *regem.* In this, as in the preceding instance of a noun agreeing with a noun, a departure is allowable in gender and in number, but not in case. Thus we may substitute *decus* or *deliciæ* for *regina.* The essential point, then, in this construction is that *a noun as a predicate must agree in case with its subject, and a noun in apposition must agree in case with the noun to which it is appended.*

HISTORIC SKETCHES, ENGLISH.—XI.

[*Continued from p.* 217.]

“PRIVILEGE!”

THE 4th of January, 1641-2, was one of the most memorable days that ever dawned for England. Westminster Hall, which had been the scene of so many important national dramas, and which was yet to be the scene of so many more, was the place in which the events that made this day momentous were enacted. It was the day on which the great question was practically tried, whether the King of England should or should not rule without the aid of his Parliament. In various forms, more or less outrageous, the question had been submitted before. Henry VIII. tried it, and so, though with less pertinacity, did Elizabeth, and the Parliament had withstood them. It was hardly likely that the designs which the men of 1530 and of 1601 had resisted, though supported by the influence and power of the great Tudors, would be accepted by their descendants in 1641 from the hands of Charles Stuart.

During the reign of James I.—1603 to 1625—the House of Commons had successfully striven to curb the royal power. Popular rights which had long lain dormant, and were likely to rust for want of use, had been revived, not without opposition. James I., the "British Solomon," or, as he was called by a wise man of his own day, "the wisest fool in Christendom," clung with the tenacity of a leech to those attributes of royalty which a small-hearted man would most value, and which were not the less annoying because they were so petty. Not all petty, though; some of the claims which the Commons disallowed were important enough. They re-established on the firmest possible basis the principle that the king has no right to levy, under any pretence whatever, a tax upon his subjects, without the consent of Parliament; they procured the abolition of an enormous abuse of the power to grant monopolies or patents; they asserted, in the most solemn manner, the inviolability of the persons of members of Parliament, unless in cases of felony; and they revived the power which, Hallam says, "had lain like a sword in the scabbard," unused since the reign of Henry VI.—a period of 175 years —to impeach the king's ministers for bad conduct. They had impeached Francis Bacon, Viscount St. Albans, and Lord Middlesex for their misdemeanours in office, and these noblemen, as in all cases where the House of Commons is the accuser, were tried by the House of Lords. They were heavily punished; but the effect of their punishment was salutary beyond the cases immediately concerned. Ministers feared the new edge of the old weapon of the Commons, and were cautious beyond what they had been; and so the arm of the king was paralysed down quite half its length. Some ministers there were in the next reign—that of Charles I.—who neglected the warning, or thought themselves able to despise it; and thus fell the Earl of Strafford, and afterwards Archbishop Laud, and their fall dragged the king with them.

Having done so much, the Parliament—many of the leading spirits in James's Parliaments sat in the Parliaments of Charles I.—was certainly not disposed to recede. On the contrary, it was bent on yet further restraining the royal power, by putting checks on the Courts of Star Chamber (an irregular tribunal, acting above and without the law of the land, and of late years much abused) and High Commission (an equally irregular and illegal tribunal for ecclesiastical causes), by all the constitutional means in their power. Unfortunately, the king was as much resolved to win conquests for the royal prerogative as the Commons were to win them from it. Without the ability, without the brutality of Henry VIII., before which many obstacles went down, Charles I. had all that monarch's greed of power, and even more exalted notions of the nature of the royal dignity. He rested his claims on the so-called "right divine of kings" to govern rightly or wrongly, according to their conscience, which had to give account to the King of kings, but under no circumstances to the people committed to his care. He lacked the ferocity which was half the battle to "bluff King Hal," and, linked with a certain amount of cruelty which he had in common with him, were a timidity and indecision which were fatal to success in his career as a tyrant. Henry VIII. had the majority of the strong men on his side, while Charles was led astray by bigoted and wrong-headed advisers. The luckless king had come in evil times for him; but the people of England reaped the benefit of his misfortunes, and won many a fair privilege, which they left "as a rich legacy unto their issue."

Before Charles had been three years upon the throne the Commons, who had during that time suffered very greatly in several particulars, presented for his signature the Petition of Right, a statute which was not intended to declare, as it did not declare, any *new* privilege, but merely set forth—for the purpose of having them confirmed—some rights which had been invaded, but of which the origin was as old as Magna Charta. The petition contained but four demands, which the king was required to grant, viz.:—

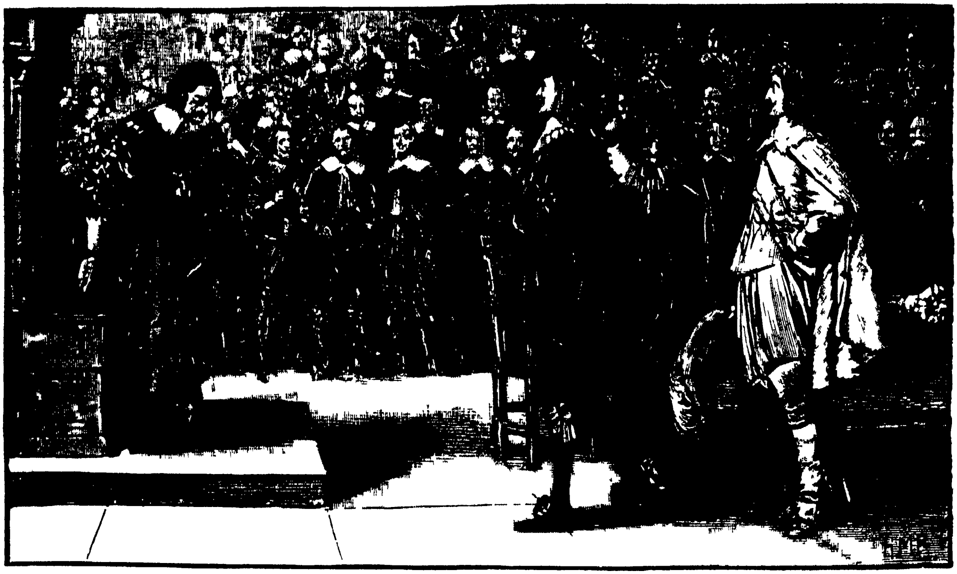
1. That no money should be levied in future, under any pretence whatever, by virtue of the king's prerogative.

2. That the committal to prison of Mr. Hampden and four others, for refusing to pay an unlawful impost, should be recognised as illegal.

3. That soldiers should not be billeted on private persons.

4. That no man should henceforth be tried by martial law.

The petition was presented in 1628. Charles tried every expedient, every shift and turn, in the hope of avoiding the necessity of complying with it. When at length compelled to give some answer, he gave a most unusual and evasive one, which clearly showed his intention to ride rough-shod over the Act at the first opportunity. It was only on the peremptory refusal of the Commons to accept his qualified assent, and after much pressure had been brought to bear, that he agreed to give the royal assent in the usual way: "Soit droit faist comme est désiré" (Let right be done as prayed).



Charles I. and Prince Rupert in the House of Commons.

Scarcely was the ink of his signature dry ere the king set about to evade the petition. He levied fresh taxes under new names; he imprisoned six members of Parliament for their conduct in the House; with the help of the Earl of Strafford he attempted to govern the kingdom without a Parliament, and with the help of Archbishop Laud to govern the Church despotically. Sentences the most severe and cruel were procured in the Star Chamber against those who resisted the Government, and in the High Commission Court against those who offended in matters ecclesiastical. So great was the oppression, both in Church and State, that many, unable any longer to endure it, sailed across the Atlantic, to seek in the New World a home and a soil in which freedom might flourish. Then came honourless wars, undertaken against the wish, and in favour of the enemies, of the nation; then came the troubles in Scotland, which quickly threw off the yoke Charles tried to lay upon it; there were the intrigues of the Queen, Henrietta Maria; there were the trials and executions of Strafford and Archbishop Laud; the Irish rebellion; the angry reception of the Grand Remonstrance; and, finally, there was the attempt to arrest the five members of the House of Commons.

This last was the drop that filled the bucket, and made it overflow. Charles, indignant at the speech and behaviour of Lord Kimbolton (son of the Earl of Manchester), and five members of the Lower House (Sir Arthur Hazelrig, Hollis, Hampden, Pym, and Strode), during the recent differences between the king and the Parliament, in an evil hour listened to the advice of Henrietta, his queen, and to the advice of Lord Digby and the courtiers. They urged him to show himself a king, advised him that no private gentleman would suffer himself to be addressed as he had been by the accused, and recommended the arrest of the members on a charge of high treason.

Orders were accordingly given, on the 3rd of January, 1641, for the arrest of the persons named. Their houses were occupied, their studies sealed up, and their papers seized. A pursuivant went down to the House of Commons and, in the king's name, demanded the surrender of the accused. He was, however, sent back without any definite answer; the House voted that what had been done by the royal officers was a breach of the privilege of

Parliament; and the king, angry at the non-compliance with his demand, resolved to go next day in person to the House, and himself arrest the accused men.

Isaac D'Israeli says: "When Charles went down to the House to seize on the five leading members of the Opposition, the Queen could not restrain her lively temper, and impatiently babbled the plot, so that one of the ladies in attendance despatched a hasty note to the parties, who, as the king entered the House, had just time to leave it." The lady in question was the Countess of Carlisle, who was on intimate terms with several of the accused. On receipt of her note, which was communicated to the House, a brief but excited debate took place. Some were for directing the accused to absent themselves, hoping thereby to avoid an unseemly quarrel; others were inclined to have them remain, and to make common cause with them, in case of any violence being offered. While the debate was yet going on, the gentlemen most concerned being themselves undecided as to the best course to adopt, a friend of Mr. Fiennes, a member, came hurriedly, and told him that the king had already left Whitehall at the head of 200 armed men, and was coming in the direction of the House. There was no time for further talk. Action must be taken forthwith. A motion was hurriedly passed, giving leave to the five members to absent themselves, and they quitted the House a few seconds only before the king entered it.

Up Westminster Hall—the place which was only a few years later to witness his trial and condemnation—King Charles walked, followed by his ordinary retinue, and a force of soldiers variously estimated at two, three, and even five hundred men. "It struck such a fear and terrour into all those that kept shops in the said Hall, or near the gate thereof, as they instantly shut up their shops, looking for nothing but bloodshed and desolation"—so wrote an eye-witness of the affair. Arrived in the Hall the armed men formed a lane, stretching down the whole length of it; the king passed along, and going up the staircase out of the Hall went into the Commons' House, "where never king was (as they say) but once King Henry the Eighth."

Attended only by his nephew Rupert, the son of the Elector Palatine of the Rhine, the king entered the House, the door of which, however, was kept open; and through the open door were to be seen officers and soldiers armed with swords and pistols, while the Earl of Roxborough and a Captain Hide stood within the door, and leaned against it.

The Speaker of the House, Lenthal, had been instructed to sit still, with the mace before him; but when the king entered, and the whole House rose and uncovered their heads, Lenthal also rose and stood in front of the chair. Charles removed his hat, and bowed to either side of the House as he came up. "Mr. Speaker, I must for a time make bold with your chair," he said, as he approached Lenthal, who made way for him, though the king did not sit down in the chair, but stood on the step of it.

A deep silence reigned in the House, till the king, who had been occupied in looking round for the five members, said, breaking in upon the silence, "Gentlemen, I am sorry for this occasion of coming unto you. Yesterday I sent a sergeant-at-arms upon a very important occasion, to apprehend some that, by my command, were accused of high treason; whereunto I did expect obedience, and not a message. And I must declare unto you here, that albeit no king that ever was in England shall be more careful of your privileges, to maintain them to the uttermost of his power, than shall I be, yet you must know that in cases of treason no person hath a privilege. And therefore I am come to know if any of these persons that were accused are here." These were the words of an incautious man; one can see in them the inability of the Stuarts to read the signs of the times, and to know when to give way.

No one answered. Charles, after a pause, made a few more remarks, and then asked specifically for each of the accused. No one informing him, he turned to Speaker Lenthal, requiring to be told; but Lenthal, kneeling, humbly desired to be excused, saying: "I have neither eyes to see nor tongue to speak in this place but as the House is pleased to direct me, whose servant I am here; and I humbly beg your Majesty's pardon that I cannot give any other answer than this to what your Majesty is pleased to demand of me."

Baffled by the silence, and by the extreme courtesy evinced by the attitude of the House, the king went on to make some further remarks, with difficulty concealing, in the midst of his excitement, the natural infirmity of his speech. Not seeing those for whom he sought, he said, "Well, since I see all my birds are flown, I do expect from you that you will send them unto me as soon as they return hither. . . . I will trouble you no more, but tell you I do expect, as soon as they come to the House, you will send them to me; otherwise I must take my own course to find them."

With the same show of respect they had made him when he came in, the assembled members waited on him as he again passed down their ranks. Bareheaded and in silence, they allowed him to get as far as the door; but ere that had closed upon him low mutterings of anger were raised, and the cry of "Privilege! Privilege!" mingled ominously with the conversation in which the king told his friends in the Hall of the result of his errand. It became evident to the most casual observer that a great crisis was at hand.

The five members were not arrested, though the king spared no pains to take them. By all means in his power he tried to get hold of them—by warrants, by proclamations, by personal application. No one would betray them; and it having been resolved to restore them to their seats in the Commons' House, the king feared the temper of which this resolution was the sign, and within a week of his foolish visit to Westminster to arrest the members he was a fugitive from London, deeming himself not safe from the violence his actions had aroused. It was indeed time.

By his recent conduct, no more than consistent with his former conduct, he had thrown down a challenge to the nation. The House of Commons took it up. Forster well says: "It had become clear that the attempt upon the members could not be defeated without a complete overthrow of the power of the king. He could not remain at Whitehall if they returned to Westminster. Charles raised the issue, the Commons accepted it, and so began our Great Civil War." That war was only brought to an end by the death of its instigator.

See:—John Forster, *Arrest of the Five Members*; Clarendon, *History of the Rebellion*; *Cassell's History of England*.

FRENCH.—XI.

[*Continued from p.* 208]

REFLECTIVE OR PRONOMINAL VERBS

EXAMPLE—Se flatter, *to flatter oneself*.

INFINITIVE MOOD.

PRESENT.	PAST.
Se flatter, *to flatter oneself*.	S'être flatté, *to have flattered oneself*.

PARTICIPLES.

PRESENT.	PAST.
Se flattant, *flattering oneself*.	S'étant flatté, *having flattered oneself*.

INDICATIVE MOOD.

PRESENT.

Je me flatte,	*I flatter myself.*
Tu te flattes,	*thou flatterest thyself.*
Il se flatte,	*he flatters himself.*
On se flatte,	*one flatters oneself.*
Nous nous flattons,	*we flatter ourselves.*
Vous vous flattez,	*you flatter yourselves.*
Ils se flattent,	*they flatter themselves.*

IMPERFECT.

Je me flattais,	*I was flattering* or *used to flatter myself.*
Tu te flattais,	*thou wast flattering thyself.*
Il se flattait,	*he was flattering himself.*
On se flattait,	*one was flattering oneself.*
Nous nous flattions,	*we were flattering ourselves.*
Vous vous flattiez	*you were flattering yourselves.*
Ils se flattaient,	*they were flattering themselves.*

PAST DEFINITE.

Je me flattai,	*I flattered* or *did flatter myself.*
Tu te flattas,	*thou didst flatter thyself.*
Il se flatta,	*he flattered himself.*
On se flatta,	*one flattered oneself.*
Nous nous flattâmes,	*we flattered ourselves.*
Vous vous flattâtes,	*you flattered yourselves.*
Ils se flattèrent,	*they flattered themselves.*

PAST INDEFINITE.

Je me suis flatté, *m.* flattee, *f.*	*I have flattered myself.*
Tu t'es flatté, *m.* flattee, *f.*	*thou hast flattered thyself.*
Il s'est flatté, *m.*	*he has flattered himself.*
Elle s'est flattée, *f.*	*she has flattered herself.*
On s'est flatte,	*one has flattered oneself.*
Nous nous sommes flattés, *m.* flattées, *f.*	*we have flattered ourselves.*
Vous vous êtes flattés, *m.* flattées, *f.*	*you have flattered yourselves.*
Ils se sont flattés, *m.*	*they have flattered themselves.*
Elles se sont flattées, *f.*	*they have flattered themselves.*

PLUPERFECT.

Je m'étais flatté, *m.* flattée, *f.*	*I had flattered myself.*
Tu t'etais flatté, *m.* flattée, *f.*	*thou hadst flattered thyself.*
Il s'etait flatte, *m.*	*he had flattered himself.*
Elle s'était flattee, *f.*	*she had flattered herself*
On s'etait flatté,	*one had flattered oneself.*
Nous nous étions flattés, *m.* flattees, *f.*	*we had flattered ourselves*
Vous vous étiez flattés, *m.* flattees, *f*	*you had flattered yourselves*
Ils s'étaient flattés, *m.*	*they had flattered themselves.*
Elles s'etaient flattees, *f.*	*they had flattered themselves.*

PAST ANTERIOR.

Je me fus flatté, *m.* flattee, *f.*	*I had flattered myself.*
Tu te fus flatté, *m.* flattee, *f.*	*thou hadst flattered thyself.*
Il se fut flatté, *m.*	*he had flattered himself.*
Elle se fut flattee, *f.*	*she had flattered herself.*
On se fut flatté,	*one had flattered oneself.*
Nous nous fûmes flattés, *m.* flattées, *f.*	*we had flattered ourselves.*
Vous vous fûtes flattés, *m.* flattees, *f.*	*you had flattered yourselves.*
Ils se furent flattes, *m.*	*they had flattered themselves.*
Elles se furent flattées, *f.*	*they had flattered themselves.*

FUTURE.

Je me flatterai,	*I shall flatter myself.*
Tu te flatteras,	*thou wilt flatter thyself.*
Il se flattera,	*he will flatter himself.*
On se flattera,	*one will flatter oneself.*
Nous nous flatterons,	*we shall flatter ourselves.*
Vous vous flatterez,	*you will flatter yourselves.*
Ils se flatteront,	*they will flatter themselves.*

FUTURE ANTERIOR.

Je me serai flatté, *m.* flattée, *f.*	*I shall have flattered myself*
Tu te seras flatté, *m.* flattée, *f.*	*thou wilt have flattered thyself.*
Il se sera flatté, *m.*	*he will have flattered himself.*
Elle se sera flattée, *f.*	*she will have flattered herself.*
On se sera flatte,	*one will have flattered oneself.*
Nous nous serons flattés, *m.* flattées, *f.*	*we shall have flattered ourselves.*
Vous vous serez flattés, *m.* flattées, *f.*	*you will have flattered yourselves.*
Ils se seront flattés, *m.*	*they will have flattered themselves.*
Elles se seront flattées, *f.*	*they will have flattered themselves.*

CONDITIONAL MOOD.

PRESENT.

Je me flatterais,	*I should flatter myself.*
Tu te flatterais,	*thou wouldst flatter thyself.*
Il se flatterait,	*he would flatter himself.*
On se flatterait,	*one would flatter oneself*
Nous nous flatterions,	*we should flatter ourselves.*
Vous vous flatteriez,	*you would flatter yourselves.*
Ils se flatteraient,	*they would flatter themselves.*

PAST.

Je me serais flatté, *m.* flattee, *f.*	*I should have flattered myself.*
Tu te serais flatté, *m.* flattée, *f.*	*thou wouldst have flattered thyself.*
Il se serait flatté, *m.*	*he would have flattered himself.*
Elle se serait flattée, *f.*	*she would have flattered herself.*
On se serait flatté,	*one would have flattered oneself.*
Nous nous serions flattés, *m.* flattées, *f.*	*we should have flattered ourselves*
Vous vous seriez flattés, *m.* flattées, *f.*	*you would have flattered yourselves.*
Ils se seraient flattés, *m.*	*they would have flattered themselves.*
Elles se seraient flattées, *f.*	*they would have flattered themselves.*

IMPERATIVE MOOD.

Flatte-toi,	*flatter thyself.*
Qu'il se flatte,	*let him flatter himself.*
Qu'on se flatte,	*let one flatter oneself.*
Flattons-nous,	*let us flatter ourselves.*
Flattez-vous,	*flatter yourselves.*
Qu'ils se flattent,	*let them flatter themselves.*

SUBJUNCTIVE MOOD.

PRESENT.

Que je me flatte,	*that I may flatter myself.*
Que tu te flattes,	*that thou mayest flatter thyself.*
Qu'il se flatte,	*that he may flatter himself.*
Qu'on se flatte,	*that one may flatter oneself.*
Que nous nous flattions,	*that we may flatter ourselves.*
Que vous vous flattiez,	*that you may flatter yourselves.*
Qu'ils se flattent,	*that they may flatter themselves.*

IMPERFECT.

Que je me flattasse,	*that I might flatter myself.*
Que tu te flattasses,	*that thou mightest flatter thyself.*
Qu'il se flattât,	*that he might flatter himself.*
Qu'on se flattât,	*that one might flatter oneself*
Que nous nous flattassions,	*that we might flatter ourselves*
Que vous vous flattassiez,	*that you might flatter yourselves.*
Qu'ils se flattassent,	*that they might flatter themselves.*

PAST.

Que je me sois flatté, *m.* flattée, *f*	*that I may have flattered myself.*
Que tu te sois, flatté, *m.* flattee, *f.*	*that thou mayest have flattered thyself.*
Qu'il se soit flatté, *m.*	*that he may have flattered himself.*
Qu'elle se soit flattée, *f.*	*that she may have flattered herself.*
Qu'on se soit flatté,	*that one may have flattered oneself.*
Que nous nous soyons flattés, *m.* flattées, *f.*	*that we may have flattered ourselves.*
Que vous vous soyez flattés, *m.* flattées, *f.*	*that you may have flattered yourselves*
Qu'ils se soient flattés, *m.*	*that they may have flattered themselves.*
Qu'elles se soient flattées, *f.*	*that they may have flattered themselves.*

PLUPERFECT.

Que je me fusse flatté, *m.* flattée, *f.*	*that I might have flattered myself.*
Que tu te fusses flatté, *m.* flattée, *f.*	*that thou mightest have flattered thyself.*
Qu'il se fût flatté, *m.*	*that he might have flattered himself.*
Qu'elle se fût flattée, *f.*	*that she might have flattered herself.*
Qu'on se fût flatté,	*that one might have flattered oneself.*
Que nous nous fussions flattés, *m.* flattées, *f.*	*that we might have flattered ourselves.*
Que vous vous fussiez flattés, *m.* flattées, *f.*	*that you might have flattered yourselves.*
Qu'ils se fussent flattés, *m.*	*that they might have flattered themselves.*
Qu'elles se fussent flattées, *f.*	*that they might have flattered themselves.*

The above is the model upon which reflective or pronominal verbs are to be conjugated.

A verb is called pronominal when it is conjugated with two pronouns of the same person, *i.e.*, the usual nominative pronoun and the pronouns *me*, *te*, *se*, etc.

In these verbs, the second pronoun is in fact only the objective pronoun direct or indirect, which is placed before the verb.

These verbs express—

1stly, an action performed and suffered by the subject. They are then called *pronominal reflective verbs*, as :—

Il se flatte.	*He flatters himself.*
Ils se louent.	*They praise themselves.*

2ndly, an action reciprocated between two or more subjects, in which case they are only used in the plural, and are called *pronominal reciprocal verbs*, as :—

Nous nous aiderons l'un l'autre.	*We shall help each other.*
Ces enfants s'entr'aiment.	*These children love one another.*

3rdly, an action strictly confined to the subject; these are called *naturally pronominal verbs*, and are expressed in English by transitive or intransitive verbs as the case may be :—

Je me souviens de cela.	*I remember that.*
Son oiseau s'envolera	*Her bird will fly away.*

From the point of view of form, it may be said that there are only two classes of reflective verbs: (1) those which are reflective by nature, as **s'évanouir**, *to vanish;* (2) active or neuter verbs used as reflective, as **se laver**, *to wash oneself;* **se nuire**, *to hurt oneself.* The reflective verb in its simple tenses is declined like an active, but its composite tenses are formed with *être*. In the composite tenses the participle agrees with the subject if the verb is reflective by nature or an active verb used as a reflective; if it is a neuter verb used as a reflective the participle remains unchanged.

The reflective form of the verb, which is much more frequently used in French than in English, often answers to the passive form so common in the latter language :—

Cela se voit tous les jours.	*That is seen every day*—literally, *That sees itself every day.*
Cette marchandise se vend facilement.	*That merchandise is easily sold.* *That merchandise sells itself easily.*
Cela se fait ainsi.	*That is done thus.* *That does itself so.*

The verb *se porter*, literally, *to carry oneself*, is used idiomatically for *to do* or *to be* in speaking of health :—

Comment vous portez-vous?	*How do you do?*
Je me porte très bien.	*I am very well.*

S'asseoir, meaning *to sit down*, is also a reflective verb:—

Votre frère s'assied.	*Your brother sits down.*

Se promener means *to walk*, *to ride*, etc., for pleasure or health:—

Je me promène tous les jours.	*I take a walk every day.*
Je me promène à cheval.	*I take a ride.*

Marcher, *aller à cheval*, *aller en voiture*, signify *to walk* or *to ride*, when we express simply the manner of progressing:—

Marchez-vous beaucoup tous les jours.	*Do you walk much every day?*
Je vais à cheval et en voiture.	*I ride on horseback and in a carriage.*

PRESENT INDICATIVE OF SE PORTER, SE PROMENER, AND S'ASSEOIR.

SE PORTER, *to be* or *do*.	SE PROMEN-ER, *to walk* or *ride*.	S'ASSE-OIR, ir. *to sit down*.
Je me porte, *I am* or *do*,	Je me promène, *I take a walk* or *ride*,	Je m'assieds, *I sit down* or *am sitting down*,
Tu te portes,	Tu te promènes,	Tu t'assieds,
Il se porte,	Il se promène,	Il s'assied,
Nous nous portons,	Nous nous promenons,	Nous nous asseyons,
Vous vous portez,	Vous vous promenez,	Vous vous asseyez,
Ils se portent.	Ils se promènent.	Ils s'asseient.

MISCELLANEOUS EXAMPLES.

A quoi vous appliquez-vous?	*To what do you apply yourself?*
Je m'occupe de mes affaires.	*I occupy myself with my affairs.*
Je m'adresse à mes amis.	*I apply to my friends.*
Comment se porte Monsieur votre père?	*How is your father?*
Je m'assieds quand je suis fatigué.	*I sit down when I am weary.*
Vous promenez-vous tous les jours?	*Do you take a walk every day?*
Ne nous asseyons pas, il est trop tard.	*Let us not sit down, it is too late.*
Combien ce drap se vend-il le* mètre?	*At how much is that cloth sold a yard?*

VOCABULARY.

Banquier, m. *banker.*
Cheval, m. *horse.*
Comment, *how.*
Fatigué, -e, *weary*, *tired.*
Magnifique, *magnificent.*
Matin, m. *morning.*
Mètre, m *yard.*
Mieux, *better.*
Obligé, -e, *obliged.*
Pied, m. *foot.*
Port-er, 1, *to carry*, *wear.*
Quelquefois, *sometimes.*
Quitt-er, 1, *to leave.*

EXERCISE 75.

Translate into English:—

1. Comment ce monsieur s'appelle-t-il? 2. Je ne sais comment il s'appelle. 3. Cette dame ne s'appelle-t-elle pas L.? 4. Non, Madame, elle s'appelle M. 5. Monsieur votre père se porte-t-il bien ce matin? 6. Il se porte beaucoup mieux. 7. Fait-il beau temps aujourd'hui? 8. Il fait un temps magnifique; n'allez-vous pas vous promener? 9. Nous n'avons ni cheval ni voiture. 10. Ne pouvez-vous marcher? 11. Je suis trop fatigué pour marcher. 12. N'allez-vous pas à cheval tous les matins? 13. Je me promène tous les matins. 14. Comment vous promenez-vous? 15. Quelquefois à pied et quelquefois en voiture. 16. À qui vous adressez-vous quand vous avez besoin d'argent? 17. Je m'adresse à mon banquier. 18. Ne voulez-vous pas vous asseoir? 19. Nous vous sommes bien obligés.

EXERCISE 76.

Translate into French:—

1. Does your sister walk every day? 2. She takes a walk every morning. 3. She likes riding on horseback and in a carriage. 4. What is that little girl called? 5. She is called L. 6. Is not that gentleman called L.? 7. No, Sir, he is called G., and his cousin is called H. 8. How is your brother? 9. My brother is very well, but my sister is not well. 10. How are your two daughters? 11. They are tolerably well to-day. 12. Will you not sit down, gentlemen? 13. We are much obliged to you, Madam, we have not time. 14. Does that book sell well? 15. It sells very well. 16. How much is that silk sold at a yard? 17. It is sold at six francs a yard. 18. Is it fine weather to-day? 19. It is very fine weather; will you not take a walk? 20. I have no time to walk. 21. To whom does your brother apply? 22. He applies to his banker. 23. Is his brother at home? 24. No, Sir, he is at Paris. 25. When does he intend to go to France? 26. He intends to go to France in one month. 27. Is your sister to leave to-morrow morning? 28. She is to leave to-day if it is fine weather. 29. What do people say of this? 30. Nothing is said about it. 31. Are you too much fatigued to walk? 32. I am not too much fatigued, but I have no wish to walk. 33. Do you like walking or riding? 34. I like riding, when I have a good horse. 35. I do not like walking.

REFLECTIVE PRONOUNS USED WITH VERBS.

Some verbs in French take two objects, of which one is the reflective pronoun, and the other a noun denoting a portion of the body:—

Vous chauffez-vous les pieds?	*Do you warm your feet?*
Je me chauffe les mains et les pieds.	*I warm my hands and feet.*

Se souvenir, *se rappeler*, correspond to the English verb *to remember*. *Se rappeler* takes a direct object besides its pronoun, whether the former is a noun or a pronoun:—

Vous rappelez-vous ces demoiselles?	*Do you remember those young ladies?*
Je ne me les rappelle pas.	*I do not remember them.*

Custom seems, however, to sanction the use of the preposition *de* between the verb *se rappeler* and an infinitive:—

Nous ne nous rappelons pas d'en avoir été privés.	*We do not remember having been deprived of it.*

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* **The English indefinite article *a* or *an* before a noun expressing measure is rendered into French by the definite article *le*, *la*, when mentioning a price.**

Se souvenir takes the preposition ***de*** before a noun or pronoun as well as before an infinitive :—

Vous souvenez-vous de cette affaire ?	*Do you remember that affair ?*
Je ne m'en souviens pas.	*I do not remember it.*
Je me souviens de lui avoir écrit.	*I remember having written to him.*

Se coucher corresponds to the English verbs ***to retire, to go to bed :—***

Je me couche de bonne heure.	*I retire early.*

Se lever means *to rise, to get up :—*

Je me lève au point du jour.	*I rise at the break of day.*

MISCELLANEOUS EXAMPLES.

Vous coupez-vous les doigts ?	*Do you cut your fingers ?*
Je me coupe souvent les doigts quand je taille ma plume.	*I often cut my fingers when I mend my pen.*
Vous rappelez-vous les malheurs du frère de votre ami ?	*Do you remember the misfortunes of your friend's brother ?*
Je me rappelle ses malheurs.	*I remember his misfortunes.*
Je ne m'en souviens pas du tout.	*I do not remember it at all.*
Nous nous couchons tous les jours au coucher du soleil.	*We go to bed every day at sunset.*
Nous nous levons de meilleure heure que vous—au lever du soleil.	*We rise earlier than you—at sunrise.*

VOCABULARY.

Associé, m. *partner.*
Bois, m. *wood.*
Boucher, m. *butcher.*
Charpentier, m. *carpenter.*
De meilleure heure, *earlier.*
Doigt, m. *finger.*
Fer, m. *iron.*
Feu, m. *fire.*
Main, f. *hand.*
Parfaitement, *perfectly.*
Parfois, *sometimes.*
Perruquier, m. *hair-dresser.*
Poêle, m. *stove.*
Pouce, m. *thumb.*
Promesse, f. *promise.*
Travaill-er, 1, *to work.*
Se brûl-er, 1, ref. *to burn oneself.*
Se chauff-er, 1, ref. *to warm oneself.*
Se souven-ir, 2, ref. *to remember.*
S'occup-er, 1, ref. *to occupy oneself.*

EXERCISE 77.

Translate into English :—

1. Le perruquier se coupe-t-il le pouce ? 2. Non, Monsieur, il ne se coupe pas le pouce. 3. Le charpentier ne se coupe-t-il pas la main ? 4. Il ne se coupe pas la main. 5. Ne vous rappelez-vous pas cette dame ? 6. Je me rappelle cette dame et ces messieurs. 7. De quoi vous occupez-vous ? 8. Nous nous occupons de nos affaires. 9. Vous souvenez-vous des fusils de votre père ? 10. Je ne m'en souviens point du tout. 11. Cette petite fille ne se brûle-t elle pas ? 12. Elle ne se brûle pas, il n'y a pas de feu dans le poêle. 13. Pourquoi le boucher ne se chauffe-t-il pas ? 14. Parce qu'il n'a pas froid. 15. Ces enfants se lèvent-ils de meilleure heure que moi ? 16. Ils se couchent de bonne heure, et ils se lèvent tous le matins à six heures. 17. Votre associé ne veut-il pas s'asseoir ? 18. Il n'a pas le temps de s'asseoir. 19. Vous souvenez-vous de vos promesses ? 20. Je m'en souviens parfaitement. 21. Ne vous chauffez-vous pas quand vous avez froid ? 22. Je ne me chauffe presque jamais. 23. Ne se couche-t-on pas quand on a sommeil ? 24. On se couche quand on a sommeil, et on mange quand on a faim. 25. Quand on se porte bien, se lève-t-on de bonne heure ? 26. Quand on se porte bien, on doit (*should*) se lever de bonne heure.

EXERCISE 78.

Translate into French :—

1. Do you rise early when you are well ? 2. When I am well I rise every morning at five o'clock. 3. Do you remember your cousin L. ? 4. I remember him perfectly well. 5. Do you go to bed early ? 6. We go to bed at ten o'clock. 7. Does not the tailor burn his fingers ? 8. He does not burn his fingers ; his iron is not warm. 9. Does the carpenter cut his thumb ? 10. He cuts neither his thumb nor his hand. 11. Why do you not warm yourself ? 12. I do not warm myself because I am not cold. 13. Is it not very cold to-day ? 14. It is not cold to-day ; it rains. 15. Does your hair-dresser rise at sunrise ? 16. The carpenter rises at sunrise and goes to bed at sunset. 17. Do you rise earlier than I ? 18. We rise every morning at the break of day. 19. Do you cut your hair often ? 20. I cut my hair every month. 21. Do you remember that gentleman ? 22. I remember him very well. 23. I do not remember him. 24. Do you cut your fingers when you mend a pen ? 25. I sometimes cut my hand when I work. 26. Do you remember what you learn ? 27. I do not remember all that I learn. 28. Do you know if your father is well ? 29. He is very well to-day. 30. Is not your mother well ? 31. She is not very well. 32. Do you remember your friend's misfortunes ? 33. I remember them. 34. I remember that.

USE OF REFLECTIVE VERBS.

The verb *tromper*, used in the active voice, corresponds to the English verb *to deceive :—*

Il trompe tout le monde.	*He deceives everybody.*

Used reflectively, *se tromper* means *to be mistaken*, literally, *to deceive oneself :—*

On se trompe bien souvent.	*One is very often mistaken.*

Ennuyer, used actively, means *to weary the mind, to tease, to bore :—*

Cet homme ennuie ses auditeurs.	*That man wearies his hearers.*
Vous nous ennuyez par vos demandes.	*You tease,* or *weary us by your questions.*

S'ennuyer has no exact correspondent in English. It signifies generally, *to be* or *to become mentally weary of a thing or place. To be dull, weary*, or *bored :—*

Nous nous ennuyons ici.	*We are weary of being here.*
Vous ennuyez-vous à la campagne ?	*Are you weary of being in country ?*

Je m'ennuie means, in fact, *I am mentally weary, I want change, amusement, occupation, &c. :—*

Je m'ennuie partout.	*I find no amusement anywhere.*

S'amuser answers to the English expressions, *to amuse oneself*, *to take pleasure in*, *to spend one's time in*, *to find amusement in*, *to enjoy oneself:—*

Nous nous amusons à la campagne.	*We enjoy ourselves in the country.*
Vous vous amusez à des bagatelles.	*You spend your time in trifles.*

MISCELLANEOUS EXAMPLES.

On se trompe souvent soi-même en cherchant a tromper les autres.	*We often deceive ourselves while seeking to deceive others.*
Tout le monde est sujet à se tromper.	*Everyone is apt to be mistaken.*
Vous ennuyez vos amis par vos plaintes.	*You weary your friends by your complaints.*
Je m'ennuie à la ville et je m'amuse a la campagne.	*I become weary of the city, and find amusement in the country.*
À quoi vous amusez-vous?	*In what do you amuse yourself?*
Je m'amuse à lire de l'allemand.	*I amuse myself in reading German.*

VOCABULARY.

Apprend-re, 4, ir. *to learn.*
Certainement, *certainly.*
Client, m. *client, customer.*
Ennuy-er, 1, *to tire.*
Entend-re, 4, *to hear.*
Malade, *ill.*
Memoire, m. *bill*
Préfér-er, 1, *to prefer.*
Quand, *when.*
Recev-oir, 3, *to receive*
Recit, m *story.*
Reven-ir, 2, ir. *to come back*
Tromp-er, 1, *to deceive.*

EXERCISE 79.

Translate into English :—

1. Aimez-vous à demeurer à la campagne? 2. Je préfère la campagne à la ville. 3. Vous ennuyez-vous souvent à la campagne? 4. Quand je m'ennuie à la campagne, je reviens à la ville. 5. Reçoit-on des nouvelles du Général L.? 6. On n'entend pas parler de lui. 7. Vous trompez-vous quelquefois? 8. Tout le monde se trompe quelquefois. 9. Le banquier trompe-t-il ses clients? 10. Il ne trompe ni ses clients ni ses amis, il ne trompe personne. 11. Ne vous trompez-vous pas dans ce mémoire? 12. Je ne me trompe pas. 13. Vous amusez-vous à lire ou à écrire? 14. Je m'amuse à apprendre l'allemand et le français. 15. Avez-vous tort d'apprendre les langues? 16. J'ai raison de les apprendre. 17. Vous ennuyez-vous souvent? 18. Je m'ennuie quand je n'ai rien à faire. 19. A quoi vous amusez-vous quand vous êtes à la campagne? 20. Nous nous promenons le matin, et nous travaillons le reste de la journée.

EXERCISE 80.

Translate into French :—

1. Are you not mistaken? 2. I am not mistaken. 3. Is not the banker mistaken?. 4. He is not mistaken, but his clerk is certainly mistaken. 5. Does he not deceive you? 6. He does not deceive me, he deceives nobody. 7. Are you not wrong to deceive your father? 8. I do not intend to deceive him. 9. Does not the merchant make a mistake? 10. He makes a mistake in the bill which he writes. 11. Do you like the country or the city? 12. I prefer the city; I soon become weary of the country. 13. Does not that child weary you by his questions? 14. Does not that long story weary you? 15. It does not weary me, it amuses me. 16. Do you amuse yourself when you are in the country? 17. I amuse myself; I learn French and Italian. 18. Are you not weary of remaining at your uncle's? 19. I am never weary of remaining there. 20. Is your brother often mistaken? 21. Everybody is sometimes mistaken.

USE OF REFLECTIVE VERBS (*continued*).

The pronominal verb, *se passer*, is used idiomatically in the sense of *to do without*. It is followed by the preposition *de* when it comes before a noun or a verb :—

Vous passez-vous de ce livre?	*Do you do without that book?*
Je ne puis m'en passer.	*I cannot do without it.*

Se servir [2 ir.], *to make use of*, also requires the preposition *de* before its object :—

Je me sers de votre canif.	*I use your penknife.*
Je ne m'en sers pas.	*I do not use it.*

The second example of the two rules above shows that when the object of those verbs is a thing it is represented in the sentence by the pronoun *en* :—

Je m'en sers, je m'en passe.	*I use it, I do without it.*

The pronoun used as indirect object of a reflective verb, if representing a person, follows the verb :—

Je puis me passer de lui.	*I can do without him*
Je m'adresse a vous et à elle.	*I apply to you and to her.*

S'endormir [2 ir.], *to fall asleep*, and *s'éveiller*, meaning *to awake*, are also reflective :—

Je m'endors aussitôt que je me couche.	*I fall asleep as soon as I go to bed.*
Je m'eveille à six heures du matin.	*I awake at six o'clock in the morning.*

S'approcher, *to come near*, *to approach*; **s'éloigner**, *to draw back*, *to leave*, take the preposition *de* before a noun. Their object, when a pronoun, is subject to the same rules which apply to *se servir* and *se passer*.

Votre fils s'approche-t-il du feu?	*Does your son draw near the fire.*
Il ne s'en approche pas.	*He does not come near it.*
Il s'éloigne de moi et de vous.	*He goes from me and from you.*

MISCELLANEOUS EXAMPLES.

Vous servez-vous de ce couteau?	*Do you use that knife?*
Je ne m'en sers pas, il ne coupe pas.	*I do not use it, it does not cut.*
Nous ne pouvons nous passer d'argent.	*We cannot do without money.*
Vous adressez-vous à ces messieurs?	*Do you apply to those gentlemen?*
Nous nous adressons à eux et à vous.	*We apply to them and to you*
Vous vous endormez facilement.	*You go to sleep easily.*

Je m'éveille de très bonne heure.	*I wake very early.*
Pourquoi vous approchez-vous du feu ?	*Why do you come near the fire?*
Je m'en approche parce que j'ai froid.	*I come near it because I am cold.*
Nous nous éloignons du feu.	*We go from the fire.*
Nous nous approchons de notre père.	*We go near our father.*
Nous nous approchons de lui.	*We go near him.*

VOCABULARY.

Aussi, *also.*
Aussitôt que, *as soon as.*
Demoiselle, *young lady.*
Domestique, m. *servant.*
Fenêtre, f. *window.*
Fourchette, f. *fork.*
Moins, *less.*
Obligé, -e, *obliged.*
Ordinairement, *generally.*
Quart, m. *quarter.*

EXERCISE 81.

Translate into English :—

1. Pouvez-vous vous passer d'encre ? 2. Nous pouvons nous en passer, nous n'avons rien à écrire. 3. Vous servez-vous de votre plume ? 4. Je ne m'en sers pas ; en avez-vous besoin ? 5. Ne voulez-vous pas vous approcher du feu ? 6. Je vous suis bien obligé, je n'ai pas froid. 7. Pourquoi ces demoiselles s'éloignent-elles de la fenêtre ? 8. Elles s'en éloignent parce qu'il y fait trop froid. 9. Ces enfants ne s'adressent-ils pas à vous ? 10. Ils s'adressent à moi et à mon frère. 11. À quelle heure vous éveillez-vous le matin ? 12. Je m'éveille ordinairement à six heures moins un quart. 13. Vous levez-vous aussitôt que vous vous éveillez ? 14. Je me lève aussitôt que je m'éveille. 15. De quels livres vous servez-vous ? 16. Je me sers des miens et des vôtres. 17. Ne vous servez-vous pas de ceux de votre frère ? 18. Je m'en sers aussi. 19. Les plumes dont vous vous servez sont-elles bonnes ? 20. Pourquoi votre ami s'éloigne-t-il du feu ? 21. Il s'en éloigne parce qu'il a trop chaud. 22. Pourquoi votre domestique s'en approche-t-il ? 23. Il s'en approche pour se chauffer. 24. Vous ennuyez-vous ici ? 25. Je ne m'ennuie pas.

EXERCISE 82.

Translate into French :—

1. Will you lend me your penknife ? 2. I cannot do without it ; I want it to mend my pen. 3. Do you want to use my book ? 4. I want to use it ; will you lend it to me ? 5. What knife does your brother use ? 6. He uses my father's knife and my brother's fork. 7. Will you not draw near the fire ? 8. We are much obliged to you ; we are warm. 9. Is that young lady warm enough ? 10. She is very cold. 11. Tell her to come near the fire. 12. Why do you go from the fire ? 13. We are too warm. 14. Does your brother leave the window ? 15. He leaves the window because he is cold. 16. To whom does that gentleman apply ? 17. He applies to me and to my brother. 18. Why does he not apply to me ? 19. Because he is ashamed to speak to you. 20. Do you awake early every morning ? 21. I awake early when I go to bed early. 22. Why do you go to sleep ? 23. I go to sleep because I am tired. 24. Are you afraid to go near your father ? 25. I am not afraid to approach him. 26. Can you do without us ? 27. We cannot do without you, but we can do without your brother. 28. Do you want my brother's horse ? 29. No, Sir, we can do without it. 30. Do you intend to do without money ? 31. You know very well that we cannot do without it.

KEY TO EXERCISES.

Ex. 63.—1. Do you like bread or meat ? 2. Do you go every day in the captain's wood ? 3. Is the president at home ? 4. Do you know that gentleman ? 5. Yes, Madam, I know him very well. 6. Do you know from what country he is ? 7. He is an Hungarian. 8. Does he speak German ? 9. He speaks German, Polish, Russian, Swedish, and Danish. 10. Is he not a physician ? 11. Have you a wish to learn Russian ? 12. I have a wish to learn Russian and modern Greek. 13. Do you know the gentlemen who are speaking to your sister ? 14. I do not know them. 15. Do you know where they live ? 16. I do not know where they live. 17. Have you not the history of Louis the Fourteenth in your library ? 18. Do your companions learn the ancient languages ? 19. They know several ancient and modern languages. 20. Do you speak English ? 21. I know English, and I speak it. 22. Do you know the Englishman whom we see ? 23. I do not know him.

Ex. 64.—1. Notre medecin sait-il le français ? 2. Il sait le français, l'anglais, et l'allemand. 3. Connaissez-vous le médecin français ? 4. Je le connais très bien. 5. Connaissez-vous cette dame ? 6. Je ne la connais pas. 7. Est-elle allemande ou suédoise ? 8. Elle n'est ni allemande ni suédoise,* elle est russe. 9. Avez-vous l'intention de lui parler ? 10. J'ai l'intention de lui parler en anglais. 11. Sait-elle l'anglais ? 12. Elle sait plusieurs langues ; elle parle anglais, danois, suédois, et hongrois. 13. Monsieur votre frère est-il colonel ? 14. Non, il est capitaine. 15. Êtes-vous français ? 16. Non, je suis hongrois. 17. Savez-vous le chinois ? 18. Non, je ne sais pas le chinois. 19. Connaissez-vous l'Anglais qui demeure chez Monsieur votre frère ? 20. Je le connais. 21. Aimez-vous les livres ? 22. J'aime les livres. 23. Avez-vous envie d'apprendre le russe ? 24. Je n'ai pas envie d'apprendre le russe. 25. N'avez-vous pas le temps ? 26. Je n'ai guère de temps. (*Je n'ai que peu de temps.*)

Ex. 65.—1. Whom do you know ? 2. We know the Dutchmen of whom you speak to us. 3. What lessons are you learning ? 4. We are learning the lessons which you recommend to us. 5. Is what he tells you true ? 6. What you tell us is true. 7. Of whom do you speak to us ? 8. We speak to you of the Scotchmen who are just arrived. 9. Do you know who is just arrived ? 10. I know that the gentleman with whom your brother is acquainted is just arrived. 11. What are your sisters doing ? 12. They do almost nothing ; they have almost nothing to do. 13. What do you put into your trunk ? 14. We put into it what we have, our clothes and our linen. 15. Do you not put your shoes in it ? 16. We put in it the shoes which we want. 17. What do you want (*need*) ? 18. We want what we have. 19. Does that child know what he is doing ? 20. He knows what he does and what he says. 21. Will you not tell them

* The words *allemande*, *suédoise*, etc., are adjectives.

of it (*say it to them*)? 22. With much pleasure. 23. Are you doing what the merchant orders you? 24. We do what he tells us. 25. He speaks of that of which you speak.

Ex. 66.—1. Avez-vous ce dont vous avez besoin? 2. Nous avons ce dont nous avons besoin. 3. Le monsieur que vous connaissez est-il ici? 4. La dame dont vous parlez est ici. 5. Vient-elle d'arriver? 6. Elle vient d'arriver. 7. Connaissez-vous ce monsieur? 8. Je connais le monsieur qui parle avec M. votre père. 9. Savez-vous son nom? 10. Je ne sais pas son nom, mais je sais où il demeure. 11. Que faites-vous tous les matins? 12. Nous ne faisons presque rien; nous n'avons presque rien à faire (*que peu de choses à faire*). 13. Ce tailleur fait-il vos habillements? 14. Il fait mes habits (*habillements*), ceux de mon frère, et ceux de mon cousin. 15. Connaissez-vous l'Écossais dont parle M. votre frère (*dont M. votre frère parle*)? 16. Je le connais bien. 17. Ce que vous dites est-il vrai? 18. Ce que je dis est vrai. 19. Comprenez-vous ce que je vous dis? 20. Je comprends tout ce que vous dites. 21. De qui M. votre frère parle-t-il? 22. Il parle du monsieur dont la sœur est ici. 23. M. votre frère a-t-il tort de faire ce qu'il fait. 24. Il ne peut avoir tort de le faire. 25. Où mettez-vous mes livres? 26. Dans le coffre de M. votre frère.

Ex. 67.—1. Does General N. put on his uniform? 2. He does not put it on. 3. Why do you not wear your black cloak? 4. I am afraid of spoiling it. 5. Do you put on your satin shoes every morning? 6. I put them on on Sundays only. 7. It is twelve; does the servant lay the cloth? 8. He does not lay it yet; he is going to lay it immediately. 9. Is not dinner ready? 10. Does the servant take away the things? 11. He does not take them away yet; he has no time to take them away. 12. Do you take off your coat when you are warm? 13. I take it off when I am too warm. 14. Are you having a cloth coat made? 15. I am having a cloth coat and a black satin waistcoat made. 16. Are you not having your velvet slippers mended? 17. Are you not having a cellar dug? 18. I am having a large cellar dug. 19. What does the druggist mean? 20. He means that he wants money. 21. Do you know what that means? 22. That means that your brother is angry with you. 23. Have you a wish to put on your cloak? 24. I intend to put it on, for I am very cold. 25. I am going to take it off, for I am warm.

Ex. 68.—1. Ôtez-vous votre habit? 2. Je n'ôte pas mon habit, je le mets. 3. Ôtez-vous votre manteau quand vous avez froid? 4. Quand j'ai froid je le mets. 5. Votre petit garçon ôte-t-il ses souliers et ses bas? 6. Il les ôte, mais il va les remettre. 7. Cette petite fille met-elle le couvert? 8. Elle met le couvert tous les jours à midi. 9. Ôte-t-elle le couvert après le dîner? 10. Elle ôte le couvert tous les jours. 11. Avez-vous l'intention de vous faire faire un habit? 12. J'ai l'intention de me faire faire un habit. 13. Je vais faire faire un habit et un gilet. 14. M. votre frère fait-il raccommoder ses bottes? 15. Il les fait raccommoder. 16. Que veut dire M. votre fils? (or, *Qu'est-ce que M. votre fils veut dire?*) 17. Je ne sais pas ce qu'il veut dire. 18. Est-il fâché contre moi ou contre mon frère? 19. Il n'est fâché ni contre vous ni contre M. votre frère. 20. A-t-il peur de gâter son habit? 21. Il n'a pas peur de le gâter. 22. Le pharmacien [apothicaire *is rarely used nowadays*] a-t-il besoin d'argent? 23. Il n'a pas besoin d'argent. 24. Mlle. votre sœur a-t-elle ôté mon livre de la table? 25. Elle ne l'a pas ôté. 26. Pourquoi ôtez-vous vos souliers? 27. Je les ôte parce qu'ils me font mal.

Ex. 69.—1. What weather is it to-day?* 2. It is very beautiful weather. 3. Is it very fine weather to-day? 4. It is cloudy and damp weather. 5. Does it rain much this morning? 6. It does not rain yet, but it is going to rain. 7. Is it windy or foggy? 8. It is not windy. 9. The fog is very thick. 10. How many persons are there in the assembly? 11. There are more than two hundred persons. 12. Are there not many manuscripts in your library? 13. There are not many; there are only fifty-five. 14. Is it too cold for you in this room? 15. It is neither too cold nor too warm. 16. Is there much hay in your stable? 17. There is enough for my horse. 18. Do you remain at home when it rains? 19. When it rains I remain at home, but when it is fine weather I go to my cousin's. 20. Is there any meat in the market? 21. There is much; there is game also. 22. There is veal, mutton, and poultry. 23. Are there not also vegetables and fruit? 24. There are none. 25. There are some also.

Ex. 70.—1. Avez-vous froid ce matin? 2. Je n'ai pas froid, il fait chaud ce matin. 3. Fait-il du brouillard ou du vent? 4. Il ne fait ni brouillard ni vent, il pleut à verse. 5. Va-t-il pleuvoir ou neiger? 6. Il va geler, il fait très froid. 7. Il fait du vent et du brouillard. 8. Y a-t-il quelqu'un chez M. votre frère aujourd'hui? 9. Mon frère est à la maison, et ma sœur est à l'église. 10. Y a-t-il de la viande au marché? 11. Il y a de la viande et de la volaille. 12. Fait-il trop chaud ou trop froid dans cette chambre pour Mlle. votre sœur? 13. Il ne fait pas si chaud dans cette chambre que dans la bibliothèque de M. votre frère. 14. Y a-t-il de bons livres anglais dans la bibliothèque de Mlle. votre sœur? 15. Il y en a de bons. 16. Y a-t-il des pêches et des prunes dans votre jardin? 17. Il y en a beaucoup. 18. Restez-vous chez M. votre frère quand il neige? 19. Quand il neige nous restons à la maison. 20. Y a-t-il des dames chez Mme. votre mère? 21. Vos deux sœurs y sont aujourd'hui. 22. Avez-vous le temps d'aller les chercher? 23. Je n'ai pas le temps ce matin. 24. Votre cheval est-il à l'écurie? 25. Il n'y est pas, il est chez mon frère. 26. Grêle-t-il ce matin? 27. Il ne grêle pas, il gèle. 28. Quel temps fait-il ce matin? 29. Il fait un temps superbe. 30. Fait-il trop chaud? 31. Il ne fait ni trop chaud ni trop froid. 32. Va-t-il geler? 33. Il va neiger. 34. Neige-t-il tous les jours? 35. Il ne neige pas tous les jours, mais il neige très souvent.

Ex. 71.—1. Are you still writing the same lesson? 2. I no longer write the same, I write another. 3. Does your clerk write rapidly? 4. He writes very well, but he does not write quickly. 5. Have you not money enough to buy that estate? 6. I have money enough, but I intend to make a journey to France. 7. There is your book; do you want it? 8. I do not want it, I have another. 9. Do you still want my penknife? 10. I do not want it any more; I am going to return it to you. 11. Does our cousin live in the city. 12. He lives no longer in the city; he lives in the country. 13. Does he like to go hunting? 14. He does not like to go hunting. 15. He goes fishing every day. 16. Is our partner in Paris or in Rouen? 17. He is in Marseilles. 18. Where do you intend to take your son? 19. I am going to take him to Italy. 20. Do you live in Milan or in Florence? 21. I live neither in Milan nor in Florence, I live in Turin. 22. Does your friend live in Switzerland? 23. He lives no longer in Switzerland; he lives in Prussia. 24. Is your servant at church? 25. No, Sir, he is at school.

Ex. 72.—1. Votre commis écrit-il aussi bien que M. votre fils. 2. Il écrit passablement bien, mais pas si bien que mon fils. 3. Avez-vous assez de livres dans votre bibliothèque? 4. Je n'ai pas assez de livres, mais j'ai l'intention d'en acheter encore. 5. Voilà la lettre de Mlle. votre sœur, voulez-vous la lire? 6. J'ai l'intention de la lire. 7. M. votre fils aime-t-il à aller à la pêche? 8. Il aime à aller à la pêche et à la chasse. 9. Quand aime-t-il à aller à la pêche? 10. Quand je suis à la campagne. 11. Que faites-vous quand vous êtes à la ville? 12. Quand je suis à la ville je lis et j'apprends ma leçon. 13. Avez-vous l'intention d'aller en France cette année? 14. J'ai l'intention d'aller en Allemagne. 15. Voulez-vous aller à la ville s'il pleut? 16. Quand il pleut je reste toujours à la maison. 17. Combien d'amis avez-vous à la ville? 18. J'y ai beaucoup d'amis. 19. Y a-t-il beaucoup d'Anglais en France? 20. Il y a beaucoup d'Anglais en France et en Italie. 21. Y a-t-il plus d'Anglais en Allemagne qu'en Italie? 22. Il y a plus d'Anglais en Italie qu'en Allemagne. 23. Fait-il beau temps en Italie? 24. Il y fait très beau temps. 25. Y gèle-t-il souvent? 26. Il y gèle quelquefois, mais pas souvent. 27. Cette demoiselle lit-elle aussi bien que sa sœur? 28 Elle lit mieux que sa sœur, mais sa sœur lit mieux que moi. 29. Y a-t-il quelqu'un chez vous? 30. Mon père est à la maison.

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* When the word *weather* precedes the verb in English, the verb is rendered in French by *être*: *Le temps est beau*, the weather is fine.

Ex. 73.—1. Do they bring you money every day? 2. It is not brought to me every day. 3. Do they furnish you with clothes when you want them? 4. They furnish me with some every time that (*whenever*) I want them. 5. Do we want (*need*) money when we are sick? 6. When we are sick we want it much. 7. Have you heard from my son? 8. I have not heard. 9. Is it not said that he is in Africa? 10. It is said that he is to go to (*to leave for*) Algiers. 11. When is he to commence his journey (*or* voyage)? 12. It is said that he is to commence it next month 13. Does that marriage take place to-day or to-morrow? 14. We are told that it is to take place this afternoon. 15. It will take place at half-past five. 16. Have you a desire to come instead of your brother? 17. My brother is to come instead of our cousin. 18. Do you intend to tell him what he is to do? 19. He knows what he is to do. 20. Do you know any news? 21. There is no news. 22. Is much gold found in California? 23. Much is found there. 24. Do they also find diamonds? 25. They find none; they find only gold.

Ex. 74.—1. Que dit-on de moi? 2. On dit que vous n'êtes pas très attentif à vos leçons. 3 Dit-on qu'on trouve beaucoup d'or en Afrique? 4. On dit qu'on trouve beaucoup d'or en Californie. 5. Vous apporte t-on des livres tous les jours? 6. On m'apporte des livres tous les jours, mais je n'ai pas le temps de les lire. 7. Que doit-on faire quand on est malade? 8. On doit envoyer chercher un médecin. 9. Envoyez-vous chercher mon frère? 10. Je dois l'envoyer chercher ce matin? 11. Recevez-vous tous les jours des nouvelles de M. votre fils? 12. Je reçois de ses nouvelles toutes les fois que M. votre frère vient. 13. La vente a-t-elle lieu aujourd'hui? 14. Elle a lieu cette après-midi. 15. À quelle heure a-t-elle lieu? 16. Elle a lieu à trois heures et demie. 17. J'ai envie d'aller, mais mon frère est malade. 18. Que dois-je faire? 19. Vous devez ecrire à M. votre frère, qui, dit-on, est très malade. 20. Doit-il partir pour l'Afrique? 21. Il doit partir pour Alger. 22. Venez-vous au lieu de M. votre père? 23. Je dois écrire au lieu de lui. 24. Le concert a-t-il lieu ce matin? 25. Il doit avoir lieu cette après-midi.

ARITHMETIC.—XI.

[*Continued from p.* 247.]

COMPOUND DIVISION.

11. THE process of dividing a compound quantity may be regarded in two aspects.

(1) We may divide a compound quantity by an abstract number; that is, we may divide the compound number into a given number of equal parts, and thus find the magnitude of one of these parts.

(2) We may divide a compound quantity by a compound quantity; that is, we may find *how many times* one given compound quantity is contained in another. Thus £14 10s. 6d. = 7 times £2 1s. 6d.

Therefore £14 10s. 6d. divided by the abstract number 7 gives as a result £2 1s. 6d. Here we have shown that if £14 10s. 6d. be divided into 7 equal parts, the magnitude of each part is £2 1s. 6d.

Again, £14 10s. 6d. divided by £2 1s. 6d. gives 7 as a quotient. This is the same as saying that £14 10s. 6d. contains £2 1s. 6d. 7 times.

Hence we see that a compound quantity divided by an abstract number gives a compound quantity, and that a compound quantity divided by a compound quantity of the same kind gives an abstract number as a quotient.

Obs.—The last remark is the same thing as saying that the *ratio* (Art. 1, lesson VIII., Vol. II., page 110) of two concrete quantities of the same kind must be an abstract number. It is of the nature of *how many times*.

Furthermore, notice that if two concrete numbers are to be compared—that is, if one is to be divided by the other—they must be of the *same kind*. To talk, for instance, of the ratio of 25 shillings to 13 lb. would simply be an absurdity.

12. EXAMPLE.—Divide £87 10s. 7½d. by 47.

Beginning with the pounds, we find that £87 divided by 47 gives £1, with a remainder £40. Reducing these £40 to shillings, and adding in the 10 shillings of the dividend, we get 810 shillings, which, divided by 47, gives 17 shillings, with a remainder 11 shillings. Reducing these 11 shillings to pence, and adding in the 7 pence of the dividend, we get 139 pence, which, divided by 47, gives 2 pence and a remainder 45 pence. Reducing the 45 pence to farthings, and adding in the 2 farthings of the dividend, we get 182 farthings, which, divided by 47, gives 3 farthings, and a remainder 41, which, divided by 47, gives a fraction $\frac{41}{47}$ of a farthing. The answer, therefore, is £1 17s. 2d. $3\frac{41}{47}$f. The operation may be thus arranged:

```
47) £87  10 7½ (£1
     47
    ---
     40
     20
    ---
 47) 800 + 10 = 810s. (17s.
                47
               ---
               340
               329
               ---
                11
                12
               ---
          47) 132 + 7 = 139d. (2d.
                        94
                       ---
                        45
                         4
                       ---
                  47) 180 + 2 = 182f. (3f.
                                141
                                ---
Answer £1 17s. 2d 3 41/47 f.     41 Remainder.
```

13. The principle upon the truth of which this process depends is the same as that mentioned in Art. 3, lesson III., Vol. I., page 179, namely, that when a quantity is to be divided, if we separate it into a number of parts, and divide each part individually, the sum of all the quotients so obtained will be the required quotient.

Here notice that we have, in reality, divided £87 10s. 7½d. into the following parts:

$$£47 + 799\text{s.} + 94\text{d.} + 182 \text{ farthings};$$
$$\text{Or, } £47 + (47 \times 17\text{s.}) + (47 \times 2\text{d.}) + (47 \times 3\tfrac{41}{47} \text{ farthings}).$$

The quotients of each of these separate sums, divided by 47, are respectively

$$£1,\quad 17\text{s.},\quad 2\text{d.},\quad \text{and } 3\tfrac{41}{47} \text{ farthings}.$$

Hence the required quotient is

$$£1\ 17\text{s.}\ 2\text{d.}\ 3\tfrac{41}{47}\text{f.}$$

14. From the above remarks we see the truth of the following

Rule for Compound Division when the Divisor is an Abstract Number.

Beginning with the highest denomination, divide each separately and in succession. When there is a remainder, reduce it to the next lower denomination, adding the number of that denomination contained in the dividend, and divide the sum as before. Proceed in this manner through all the denominations.

Obs.—It is sometimes convenient, when the divisor is a composite number, to separate it into factors, and divide successively by them, instead of dividing at once by the whole divisor. For instance, if it be required to divide 75 cwt. 2 qrs. 8 lb. by 35, which = 7 × 5, we can perform the operation thus:—

$$\begin{array}{r|rrl} & \text{cwt.} & \text{qrs.} & \text{lb.} \\ 7\,) & 75 & 2 & 8 \\ \hline 5\,) & 10 & 3 & 5\tfrac{1}{7} \\ \hline & 2 & 0 & 17\tfrac{4}{5} + \tfrac{1}{35}. \end{array}$$

Notice that the $\frac{1}{35}$ arises from the division of the $\frac{1}{7}$ by 5. Adding $\frac{4}{5}$ and $\frac{1}{35}$, we get $\frac{29}{35}$; so that the required answer would be written—

$$\begin{array}{ccc} \text{cwt.} & \text{qrs.} & \text{lb.} \\ 2 & 0 & 17\tfrac{29}{35}. \end{array}$$

And, if necessary, the $\frac{29}{35}$ of a pound could be further reduced to ounces, etc.

15. When it is required to divide one compound quantity by another of the same kind we must reduce each to the *same* denomination, and then divide as in ordinary simple division; for, clearly, the number of times which one compound quantity contains another does not depend upon the particular denomination or denominations in which they happen to be expressed. Supposing one man to have 5 sovereigns in his pocket, and another 1 sovereign, the former would still have 5 times as much as the latter, if they had respectively 100 and 20 shillings instead of the sovereigns.

16. **Example.**—Divide £35 17s. 6d. by £2 11s. 3d.

$$\begin{array}{l} £35\ 17\text{s.}\ 6\text{d.} = 8610 \text{ pence.} \\ £2\ \ 11\text{s.}\ 3\text{d.} = \ \ 615 \text{ pence.} \end{array}$$

$$\begin{array}{r} 615\,)\ 8610\ (14 \\ 615 \\ \hline 2460 \\ 2460 \\ \hline \end{array}$$

Hence 14 is the answer.

We shall, however, return to this part of the subject when we treat of fractions in connection with compound quantities.

EXERCISE 56.—EXAMPLES IN COMPOUND DIVISION.

Divide—

1. £87 10s. 7½d. by 18, 27, and 39.
2. £33 by 96.
3. 312 lb. 9 oz. 18 dwt. by 7, 43, 84, and 160.
4. 410 lb. 4 oz. 5 dwt. 6 grs. by 8, 25, 39, 73, and 210.
5. 786 bush. 18 qts. by 17, 19, 21, 25, 48, 97.
6. 216 yds. 3 qrs. by 20.
7. 500 yds. 3 qrs. 2 nls. by 54, 63, and 108.
8. 365 days 10 h. 40 m. by 15 and 48.
9. 111 yrs. 20 d. 13 h. 25 m. 10 secs. by 11, 19, 83, and 100.
10. 45° 17′ 10″ by 25, 35, and 45.
11. How much a day is £200 a year?

How many times is—

12. 6s. 8½d. contained in £5?
13. £29 7s. 6d. contained in £523 15s. 3¾d.
14. 2 qrs. 13 lb. 5 oz. contained in 4 tons 3 cwt. 2 qrs. 6 lb.?

Divide—

15. 195 m. 7 fur. 30 ft. by 7 ft. 6 in.
16. 531 m. 2 fur. 10 p. by 17 m. 5 fur. 27 p.
17. 950 days 1 h. 11 min. 6 secs. by 4 days 3 h. 6 min. 54 secs.

FRACTIONS IN CONNECTION WITH COMPOUND QUANTITIES.

1. *To find the Value of any Fraction of a Compound Quantity.*

It is evident that we have only to divide the given compound quantity by the denominator, and then multiply by the numerator. The first part of the process determines the magnitude of the equal parts into which the denominator indicates that the quantity is to be divided, and the latter takes as many of those parts as are indicated by the numerator.

$$\text{Thus, } \tfrac{3}{4} \text{ of } £1 = 3 \times \tfrac{20}{4}\text{s.} = 15\text{s.}$$

$$\text{Again, } \tfrac{4}{15} \text{ of } £2 = \tfrac{4}{15} \text{ of } 40\text{s.} = 4 \times \tfrac{40}{15}\text{s.} = \frac{4 \times 8}{3}\text{s.} = \tfrac{32}{3}\text{s.};$$
$$\tfrac{32}{3}\text{s.} = 10\tfrac{2}{3}\text{s.}$$

$$\text{Again, } \tfrac{2}{3} \text{ of a shilling is } \tfrac{2}{3} \text{ of 12 pence, or } 2 \times \tfrac{12}{3}\text{d.} = 8\text{d.}$$
$$\text{Therefore, } \tfrac{4}{15} \text{ of } £2 = 10\text{s. } 8\text{d.}$$

2. Find $\frac{2}{5}$ of 3 days 4 hours 25 minutes.

$$\begin{array}{lll} \text{days.} & \text{hrs.} & \text{min.} \\ 3 & 4 & 25 \\ 24 & & \\ \hline 72 + 4 = 76 \text{ hrs.} & & \\ \quad 60 & & \\ \hline 4560 + 25 = 4585 \text{ minutes.} & & \end{array}$$

Therefore, $\frac{2}{5}$ of 3 days 4 hours 25 min. = $\frac{2}{5}$ of 4585 minutes = 2 × 917 = 1834 minutes.

Reducing 1834 to higher denominations,

$$\begin{array}{r l} 6{,}0\,)\ 183{,}4 & \\ \hline 24\,)\ \ \ 30 & \ldots\ 34 \text{ minutes.} \\ \hline 1 & \ldots\ 6 \text{ hours.} \end{array}$$

Therefore, $\frac{2}{5}$ of 3 days 4 hrs. 25 min. is 1 day 6 hrs. 34 min.

3. *To reduce one Compound Quantity to a Fraction of any other.*

Finding what fractional part of one compound quantity another given compound quantity is, is called reducing the latter quantity to the fraction of the first.

Thus, finding what fraction of one pound 6s. is, is reducing 6s. to the fraction of a pound.

This is, in fact, only another name for performing the operation of dividing one compound quantity by another, or of finding the *ratio* of two compound quantities (see Art. 11, lesson XI.).

4. **Example.**—What fraction of £1 7s. 6d. is 3s. 6d.?

£1 7s. 6d. = 330 pence.
3s. 6d. = 42 pence.

Hence, if £1 7s. 6d. be divided into 330 equal parts, 3s. 6d. contains 42 of them;

Therefore, 3s. 6d. is $\frac{42}{330}$ of £1 7s. 6d.; and $\frac{42}{330} = \frac{7}{55}$ when reduced to its lowest terms.

This might have been more shortly performed as follows:—

£1 7s. 6d. = 55 sixpences.
3s. 6d. = 7 sixpences.
Therefore, 3s. 6d. is $\frac{7}{55}$ of £1 7s. 6d.

5. Hence the following

Rule for reducing one Compound Quantity to the Fraction of another.

Having reduced them both to any the *same* denomination, take the first quantity for a numerator, and the latter for a denominator.

The denomination to which the quantities are to be reduced is a question of choice. Sometimes we can much simplify our calculation by choosing one rather than another.

6. **Example.**—Reduce £2 6s. 8d. to the fraction of £3 5s.

£2 6s. 8d. = $2\frac{1}{3}$ pounds.
£3 5s. 0d. = $3\frac{1}{4}$ pounds.

Therefore, the required fraction is $\frac{2\frac{1}{3}}{3\frac{1}{4}}$, which is $\frac{7}{3} \times \frac{4}{13}$, *i.e.*, $\frac{28}{39}$.

7. The question of Art. 2 might also have been solved as follows by the aid of the present method:—

25 minutes = $\frac{25}{60}$ of an hour = $\frac{25}{60 \times 24}$ of a day.
4 hours = $\frac{4}{24}$ of a day = $\frac{1}{6}$ of a day.

Therefore, 3 days 4 hours 25 minutes are $3 + \frac{1}{6} + \frac{25}{60 \times 24}$ days, or $3\frac{53}{288}$ of a day, or $\frac{917}{288}$ of a day.

Therefore, $\frac{2}{5}$ of 3 days 4 hours 25 minutes = $\frac{2}{5} \times \frac{917}{288}$ of a day.
= $\frac{917}{720}$ = $1\frac{197}{720}$ of a day.
$\frac{197}{720}$ of a day = $\frac{197}{720}$ × 24 hours = $\frac{197}{30}$ hours = $6\frac{17}{30}$ hours.
$\frac{17}{30}$ of an hour = $\frac{17}{30}$ × 60 minutes = 34 minutes.

Hence the required answer is 1 day 6 hours 34 minutes.

Exercise 57.

Examples in finding a Fractional Part of a Compound Quantity, and in reducing One Quantity to the Fraction of another of the same kind.

Find the value, expressed in successive denominations, of—

1. $\frac{3}{8}$ of £1; $\frac{7}{8}$ of £1; $\frac{5}{8}$ of 1s.
2. $\frac{7}{24}$ of £1; $\frac{4}{9}$ of 1s.; $\frac{11}{13}$ of 3s. 2d.
3. $\frac{4}{7}$ of 1 lb. avoir.; $\frac{5}{8}$ of 1 oz. Troy; $\frac{4}{7}$ of 1 cwt.
4. $\frac{4}{9}$ of 1 ton; $\frac{3}{8}$ of 1 yard; $\frac{5}{8}$ of 1 rod.
5. $\frac{3}{8}$ of 1 mile; $\frac{5}{8}$ of 1 gallon; $\frac{3}{8}$ of 1 peck.
6. $\frac{7}{8}$ of 1 hour; $\frac{4}{9}$ of 1 minute; $\frac{4}{7}$ of 1 degree.
7. $3\frac{3}{8}$ of $\frac{5}{8}$ of a mile; $\frac{7}{8}$ of $\frac{11}{14}$ of a week.
8. $\dfrac{\dfrac{8}{2\frac{1}{3}}}{\frac{3}{4}}$ of a guinea; $\dfrac{8\frac{1}{3}}{9\frac{4}{15}}$ of a crown.
9. If $1\frac{3}{8}$ of a sum of money = $\frac{4}{7}$ of 5s. 10d., find it.
10. Find the value of $\dfrac{2\frac{3}{4} + 1\frac{5}{8}}{\frac{13}{22} + \frac{4}{9}\text{ of }1\frac{1}{4}}$ of £20.
11. Find the sum of $\frac{1}{3}$ of 2s. $6\frac{3}{4}$d. + $\frac{1}{5}$ of £3 2s. $6\frac{1}{4}$d. + $\frac{1}{3}$ of £5 7s. $8\frac{1}{4}$d.
12. And of $\frac{1}{3}$ of 16s. $6\frac{1}{4}$d. + $\frac{1}{5}$ of 12s. $10\frac{1}{4}$d. + $\frac{1}{5}$ of £2 4s. $8\frac{3}{4}$d.
13. Find the value of $\frac{5}{24}$ of £7 4s. 1d. − $\frac{5}{21}$ of £4 0s. 1d.
14. Find the value of $\frac{5}{21}$ of £4 0s. 1d. − $\frac{5}{16}$ of £3 10s. 1d.
15. Find the value of $\dfrac{\frac{1}{3}\text{ of }\frac{1}{4} - \frac{3}{8}\text{ of }\frac{1}{5}}{\frac{4}{7}\text{ of }\frac{1}{8} + \frac{1}{4}\text{ of }\frac{4}{7}}$ of £1.

Reduce to the fraction of a pound—

16. $4\frac{3}{8}$s.; 4s. 7d.; 9s. $2\frac{1}{4}$d.
17. 18s. $0\frac{3}{4}$d.; $8\frac{1}{4}$d.; £3 15s. $9\frac{1}{2}$d.
18. What part of £1 is $\frac{1}{5}$ of a penny?
19. What part of 1 lb. Troy is 7 oz.?
20. Reduce $\frac{1}{5}$ of a quart to the fraction of a gallon.
21. Reduce $\frac{2}{3}$ of 1 second to the fraction of a week.
22. Reduce £3 17s. $11\frac{3}{4}$d. to the fraction of £7 8s.
23. Reduce 3 pecks 2 gallons to the fraction of 2 bushels.
24. Reduce 15 cwt. 65 lb. to the fraction of 2 tons 3 cwt.
25. Reduce 1° 15′ 10″ to the fraction of a right angle.
26. Reduce $1\frac{1}{4}$ acre to the fraction of 5 acres 2 r. 40 p.
27. Reduce $\frac{1}{147}$ of £1 to the fraction of a penny.
28. Reduce $\frac{4}{13}$ of a week to the fraction of a minute.
29. Reduce $\frac{3}{8}$ of $\frac{1}{5}$ of £2 8s. 9d. to the fraction of £1 1s. 8d.
30. Express as a fraction of £10 the difference between £$8\frac{1}{4}$ and $\frac{3}{4}$ of £8.
31. Find the value of $\dfrac{1\text{ lb. }7\text{ oz. }4\text{ dwt.}}{2\text{ lb. }7\text{ oz. }10\text{ dwt.}}$ of 15 guineas.
32. Find the value of $\dfrac{77\text{ dys. }4\text{ hrs. }30\text{ min.}}{6\text{ dys. }12\text{ hrs.}}$ of $\dfrac{1^\circ\ 17'}{17'\ 15''}$ of $\dfrac{136\text{ gals. }2\text{ qts.}}{178\text{ gals. }3\text{ qts.}}$ of 517 square feet 72 inches.
33. Find the value of $\dfrac{£3\ 18\text{s. }8\text{d.}}{£6\ 12\text{s. }9\text{d.}}$ of 104 yards 9 inches.

PRACTICE.

8. *Definition.*—Any fraction of a quantity the numerator of which is *unity* is called an *aliquot* part of that quantity.

Thus 4s. and 6s. 8d. are each aliquot parts of a pound, being respectively $\frac{1}{5}$ and $\frac{1}{3}$ of it.

In finding the value of any given compound quantity from the given value of any other given quantity of the same kind, a convenient form of multiplication, called *Practice*, is often employed. It depends, as will be seen, upon the principles of fractions and the judicious choice of aliquot parts.

9. **Example** 1.—Find the value of 3589 cwt. at £1 11s. 6$\frac{3}{4}$d. per cwt.

This might be effected in various ways. We might, for instance, reduce the money to farthings, multiply by 3589, and then reduce the result to pounds, shillings, and pence; or we might reduce the money to the fraction of a pound, and then, multiplying by 3589, reduce the resulting fraction to pounds, shillings, and pence. But we may also evidently obtain a correct result if we divide the whole sum into portions, multiply each of these portions separately by 3589, and then add the results together. This we are able to do, simply by the aid of aliquot parts, as follows:—

3589 cwt. at £1 per cwt. will cost . . .	£3589	0	0
Since 10s. is £$\frac{1}{2}$, 3589 cwt. at 10s. each will cost $\frac{1}{2}$ of £3589, or	1794	10	0
Since 1s. is $\frac{1}{10}$ of 10s., 3589 cwt. at 1s. each will cost $\frac{1}{10}$ of the same number at 10s. each, or $\frac{1}{10}$ of £1794 10s., which is . . .	179	9	0
Since 6d. is $\frac{1}{2}$ of 1s., 3589 cwt. at 6d. each will cost $\frac{1}{2}$ of the same number at 1s. each, or $\frac{1}{2}$ of £179 9s., or	89	14	6
Since $\frac{1}{2}$d. is $\frac{1}{12}$ of 6d., 3589 cwt. at $\frac{1}{2}$d. each will cost $\frac{1}{12}$ of the same number at 6d. each, or $\frac{1}{12}$ of £89 14s. 6d., which is. . . .	7	9	6$\frac{1}{2}$
Since $\frac{1}{4}$d. is $\frac{1}{2}$ of $\frac{1}{2}$d., 3589 cwt. at $\frac{1}{4}$d. each will cost $\frac{1}{2}$ of the same number at $\frac{1}{2}$d. each, or $\frac{1}{2}$ of £7 9s. 6$\frac{1}{2}$d., which is	3	14	9$\frac{1}{4}$
Hence 3589 at £1 + 3589 at 10s. + 3589 at 1s. + 3589 at 6d. + 3589 at $\frac{1}{2}$d. + 3589 at $\frac{1}{4}$d. will cost	£5663	17	9$\frac{3}{4}$

The above is the explanation of the process, which may be arranged as follows:—

		£	s.	d.
3589 cwt. would cost at £1 per cwt.		3589	0	0
10s. which is $\frac{1}{2}$ of £1	. . . .	1794	10	0
1s. ,, $\frac{1}{10}$ of 10s.	. . . .	179	9	0
6d. ,, $\frac{1}{2}$ of 1s.	. . . .	89	14	6
$\frac{1}{2}$d. ,, $\frac{1}{12}$ of 6d.	. . . .	7	9	6$\frac{1}{2}$
$\frac{1}{4}$d. ,, $\frac{1}{2}$ of $\frac{1}{2}$d.	. . . .	3	14	9$\frac{1}{4}$
		£5663	17	9$\frac{3}{4}$

10. If the quantity whose value is to be found, and also the price given, be each expressed in various denominations, then a somewhat different method must be adopted.

For instance, suppose it to be required to find the value of 375 cwt. 3 qrs. 21 lb. at £4 14s. 6d. per cwt.

First find the value of 375 cwt. at £4 14s. 6d. per cwt. by the previous method. This will be done as follows:—

	£	s.	d.
375 cwt. would cost at £1 per cwt. . .	375	0	0
,, ,, ,, ,, ,, £4 ,, ,, . .	1500	0	0
10s. which is $\frac{1}{2}$ of £1	187	10	0
4s. ,, $\frac{1}{5}$ of £1	75	0	0
6d. ,, $\frac{1}{8}$ of 4s.	9	7	6
	£1771	17	

Again, by the previous working—

	£	s.	d.	
1 cwt. would cost	£4	14	6	
375 cwt. would cost	1771	17	6	
2 qrs. ,, $\frac{1}{2}$ of 1 cwt., or . .	2	7	3	
1 qr. ,, $\frac{1}{2}$ of 2 qrs., or . .	1	3	7$\frac{1}{2}$	
14 lb. ,, $\frac{1}{2}$ of 1 qr., or . .	0	11	9$\frac{3}{4}$	
7 lb. ,, $\frac{1}{2}$ of 14 lb., or . .	0	5	10$\frac{3}{4}$	$\frac{1}{2}$
Therefore 375 cwt. 3 qrs. 21 lb. would cost .	£1776	6	1	$\frac{1}{2}$

The fraction being $\frac{1}{2}$ of a farthing. If, however, the fractional part of the farthing were put in terms of a fraction of a penny, the result would be written £1776 6s. 1$\frac{1}{8}$d.

11. Sometimes, by inspection, we can see that one or both of the compound quantities which are expressed in different denominations can be simply expressed as a fraction of one of the denominations. This will much simplify the operation.

Example.—Find the value of 24 cwt. 1 qr. 9 lb. 5$\frac{1}{3}$ oz. at £2 5s. 6d. per cwt.

Here it is readily seen that 1 qr. 9 lb. 5$\frac{1}{3}$ oz. is $\frac{1}{3}$ of a cwt.

Hence the question is reduced to finding the value of 24$\frac{1}{3}$ cwt.

	£	s.	d.
24 cwt. would cost at £1 per cwt. .	24	0	0
,, ,, ,, ,, ,, £2 ,, ,, . .	48	0	0
5s. which is $\frac{1}{4}$ of £1 . .	6	0	0
6d. ,, $\frac{1}{10}$ of 5s. . . .	0	12	0
At £2 5s. 6d	54	12	0
$\frac{1}{3}$ cwt. would cost	0	15	2
	£55	7	2 Ans.

12. If *both* commodity and price are easily expressible by fractions, it will generally be found most convenient to treat the question as in the following

Example.—Find the value of 15 cwt. 2 qrs. 7 lb. at £1 6s. 8d. per cwt.

15 cwt. 2 qrs. 7 lb. = $15 + \frac{1}{2} + \frac{1}{16} = 15\frac{9}{16}$ cwt.

£1 6s. 8d. = £$1\frac{1}{3}$.

Hence the required value will be $15\frac{9}{16} \times 1\frac{1}{3}$ pounds,

$$\text{Or, } \frac{\overset{83}{249}}{\underset{4}{16}} \times \frac{4}{3} = £\frac{83}{4} = £20\tfrac{3}{4} = £20\ 15s.$$

13. In employing the method of practice, a good deal must be left to the student's judgment as to dividing the compound quantity into separate portions, so that the aliquot parts shall be the most convenient.

Tables of aliquot parts of £1, of a hundredweight, an acre, etc., are drawn up for the convenience of persons much engaged in calculations; but the learner had better trust to his memory and knowledge of fractions in solving any question of the kind with which he may happen to be concerned.

EXERCISE 58.—EXAMPLES IN PRACTICE.

Find the cost of—

	£	s.	d.	
1. 1625 yards at	0	2	$8\frac{1}{2}$	per yard.
2. 1429 yards at	1	2	9	per yard.
3. 749 yards at	0	5	8	per yard.
4. 1689 yards at	0	4	$10\frac{1}{2}$	per yard.
5. 2476 yards at	0	18	6	per yard.
6. 318 cwt. at	0	8	8	per cwt.
7. 9999 tons at	7	17	6	per ton.
8. 5926 articles at	0	11	8	each.
9. 1000 articles at	5	7	6	each.
10. 2010 articles at	6	8	$10\frac{1}{2}$	each.
11. 89 articles at	3	11	$5\frac{1}{4}$	each.
12. 535 articles at	1	5	10	each.
13 112 cwt. 1 qr. 17 lb at	8	11	4	per cwt.
14 271 cwt. 1 qr. 14 lb. at	0	15	$9\frac{1}{2}$	per cwt.
15. 98 cwt. 3 qrs. 16 lb. at	3	18	6	per cwt.
16. 219 cwt. 3 qrs. 11 lb. at	2	11	$9\frac{1}{2}$	per cwt.
17. 732 lb. 5 oz. 13 dwt. at	1	8	$7\frac{1}{2}$	per lb.
18. 814 lb. 9 oz. 16 dwt. at	1	13	4	per lb.
19. 912 yds 2 qrs 3 nls. at	1	19	8	per yard.
20. 186 yds. 3 qrs. 1 nls. at	1	1	$1\frac{1}{4}$	per yard.
21. 897 a. 3 r. 32 p at	2	2	$2\frac{1}{4}$	per acre.
22. 87 qrs. 4 bush. 2 pks. at	1	17	4	per quarter.
23. 996 qrs. 7 bush. 1 pks. at	2	4	8	per quarter.

KEY TO EXERCISES.

EXERCISE 52.

1. 1806.
2 68810.
3. 86768.
4. 284079.
5. 96615.
6. £25 13s. 6d$\frac{3}{4}$.
7. £483 1s. $2\frac{3}{4}$d.
8. 66 gns. 15s. 2d.
9. 1448 sixpences, 2172 grts.
10. 6050.
11. 170472.
12. 9000.
13. 1010047.
14. 2 lb. 1 oz. 10 dwt. 16 grs.
15. 177 lb. 9 oz. 12 dwt.
16. 1785.
17. 631680.
18. 116860.
19. 80797440.
20. 9 cwt. 0 qrs. 8 lb.
21. 119 tons 6 cwt. 3 lb.
22. 19 cwt. 2 qrs. 18 lb. 1 oz.
23. 9120.
24. 37608 scruples, 752160 grains.
25. 64 lb. 11 oz. 5 dwt.
26. 88 lb. 4 oz. 7 drms 2 scps
27. 47520 yds. 142560 ft. 1710720 in.
28. 712800 ft. 8553600 in.
29. 960000 perches, 5280000 yards.
30. 54 m. 7 fur. 211 yds. 2 ft
31. 29 m. 4 fur. 172 yds. 2 ft. 7 in.
32. 5031 rods $27670\frac{1}{2}$ yards.
33. 17 m. 0 fur. 20 rods, or 17 m. 0 fur. 110 yds, or 30030 yards.
34. 132000000 feet.
35. 2560 nls. or 640 qrs.
36. 5000 qrs. or 1250 yards.
37. 6396 yds. 2 qrs. 1 nl.
38. 9802 French ells, 4 qrs. 3 nls.
39. 10156 nls, or 22851 in.
40. 51 brls. 2 gals.
41. 14851 gals. 3 qts. 1 pt. 2 qtns.
42. 100000 pints.
43. 43200 pints.
44. 105 brls. 8 gals.
45. 540 hhds. 44 gals.
46. 22760 pints.
47. 488 quarts.
48. 24440 quarts.
49. 28992 pints.
50. 1427 bush. 1 pk.
51. 506 qrs. 1 bush. 2 pks. 1 gal.
52. 36360 min. 2181600 secs.
53. 31557600 secs.
54. 34 wks. 6 hrs. 45 min., or 588 days 6 hrs. 45 min.
55. 65 days 2 hrs. 4 min. 40 secs.
56. 31556928 secs.
57. 946128000 secs.
58. 5148000 secs.
59. 9505200 secs.
60. 99000″.
61. 2126° 11′ 54″.
62. 185185 right angles 16° 40′.
63. 470660 sq ft.
64. 628714548 square inches, or $4366073\frac{1}{4}$ sq. ft.
65. 32640858860 sq. inches.
66. 582 acr. 1 rood 3 p. 29 yds. 8 ft.
67. 259200 cub. in.
68. 4551552 cub. in.
69. 2825888 cub. in.
70. 49 cub. ft. 1 in.
71. 1452 cub. yds. 12 ft.
72. 4492800 cub. in.
73. 52 tons 40 cub. ft. 180 cub. inches.
74. 576 lb avoirds.
75. 691 lb. 10[illegible] oz. avoirds.
76. 822 lb. $13\frac{3}{4}$ oz. avoirds.
77. 1324 lb. $4\frac{1}{4}$ oz. avoirds.
78. 58 lb. 4 oz. troy.
79. 122 lb. 3[illegible] oz. troy.
80. 2 lb. 8[illegible] oz. avoirds.
81. 12 square yards.
82. 360 square feet.
83. 16 acres, 0 roods, 10 rods.
84. 108 sq yds. 8 sq. feet.
85. 446 acres 1 rood.
86. 40 acres.
87. 36 square yards.
88. 66 square yards.
89. $111\frac{1}{4}$ square yards.
90. 60 cubic feet.
91. $56\frac{1}{4}$ cubic feet.
92. 8875[illegible] imp. bushels.
93. 7108[illegible] imp. gallons.
94. 77[illegible] imp. bushels.
95. 128[illegible] cub. feet.
96. $66\frac{2}{3}$ yards.
97. 27998600 cub. in.
98. 4874270936 cub. in.
99. $10\frac{1}{2}$ pieces.
100. 800 days.

EXERCISE 53.

1. £18 3s. $4\frac{1}{2}$d
2. £102 3s. $5\frac{1}{4}$d.
3. £93 0s. 2[illegible]d.
4. £4345 2s. $0\frac{3}{4}$d.
5. £57613 2s $6\frac{1}{4}$d.
6. 9 tons 8 cwt. 5 lb.
7. 45 tons 4 cwt. 45 lb. 2 oz.
8. 107 lb 7 oz. 8 dwt. 11 grains.
9. 109 leagues 2 miles 6 fur. 1 foot.
10. 468 acres 1 rood 6 p.
11. 48 sq. yds. 5 sq. ft 125 sq. in.
12. 240 gallons.
13. 115 weeks 15 hours 25 min.
14. 71 years 5 months 1 week 4 days 11 hours 7 min.
15. 2 oz. 3 drachm. 12 grains.
16. 1203 cubic yards 6 feet 1056 inches.
17. 9 square miles 36 acres 1 rd. 35 p.
18. 22 Fr. e. 4 qrs. 2 nl.
19 11 cong. 7 o 16 f℥ 5 fʒ 6 ♏.
20. 22 loads 1 quarter 3 bushels 2 pecks.

EXERCISE 54.

1. £9 2s. $8\frac{3}{4}$d.
2. £3 5s. $10\frac{1}{2}$d.
3. 8 cwt. 1 qr. 6 lb. 10 oz.
4. 24 tons 1 cwt. 83 lb.
5. 19 miles 289 rods 2 feet.
6. 1 league 1 m. 7 fur. 10 rods $12\frac{1}{4}$ feet.
7. 35 bush. 2 pks. 6 qts.
8. 19 qrs. 6 bush. 2 pks.
9. 55 yards 2 qrs. 3 nls.
10. 44 yds. 1 qr. 3 nls.
11. 85 acres 119 rods.
12 234 acres 188 rods.
13. 338 cubic feet 1722 cubic inches.
14. 25° 8′ 15″.
15. 35° 3′ 30″.
16. 54 yrs. 2 mo. 2 wks. 6 ds. 2 hrs. 45 min. 6 secs.
17. 2 years 88 days.
18. 1 year 164 days.

EXERCISE 55.

1. £247 6s. 1d.
2. £24 0s. 9d.
3. 16 tns. 16 cwt. 23 lb.
4. 403 „ 17 „ 31 „
   1356 „ 19 „ $72\frac{3}{4}$ „
5. 6 lb. 10 oz. 10 dwt.
6. 984 gals. 1 qt. 1 pt.
   1968 „ 3 „ 0 „
7. 14778 ml. 1 fur. 32 rds.
   34482 „ 4 „ 8 „
   16889 „ 3 „ 8 „
8. 2044 ls. 1 m. 4 fur. 30 r.
   8178 „ 0 „ 3 „ 0 „
   15742 „ 2 „ 5 „ 15 „
9. 8962 bushels 16 quarts.
   10456 „ 8 „
   11950 „ 0 „
   13443 „ 24 „
10. 2968 qr. 5 bsh. 2 pk. 6 qts.
    27204 „ 1 „ 2 „
11. 7821 a. 2 rods.
    60162 „ 30 „
    451218 „ 120 „
12. 1199 yr. 9 m. 3 wks. 1 d.
    2046 „ 8 „ 3 „ 5 „
    2540 „ 9 „ 1 „ 5 „
13. 24645 cubic feet 930 in.
    131442 „ 1564 „
    1327148 „ 1696 „
14. 176 rt. ang. 51° 13′ 30″.
    252 „ 21° 45′ 0″.
    448 „ 85° 4′ 48″.
15. £174678 18s. $7\frac{1}{2}$d.
    £195788 7s. 3d.
16. 40 tns. 6 cwt. 3 lb. 5 oz.
    3667 „ 12 „ 84 „ 7 „
    4308 „ 2 „ 10 „ 1 „
17. £14540116 18s. 8d.
    £16671008 9s. 3d.

GEOLOGY.—II.

[*Continued from p.* 228.]

DYNAMICAL GEOLOGY—EPIGENE AND HYPOGENE AGENCIES—EPIGENE AGENCIES, DISINTEGRATING, PRESERVATIVE, TRANSPORTING, AND RECONSTRUCTIVE—DENUDATION—ATMOSPHERIC AND FLUVIATILE ACTION.

THE agencies which we can examine in operation on the earth may be divided into two classes: those that act on the surface and those that operate from beneath it. The former are termed *epigene* (Greek, ἐπὶ, *ĕpĭ*, upon; γεννάω, *gĕnnāo*, I produce), the latter *hypogene* (Greek, ὑπὸ, *hŭpŏ*, under). Epigene agencies may be classified as either *disintegrating*, *preservative*, *transporting*, or *reconstructive*. These terms, referring to the mode in which the agencies act on the materials of the earth, almost explain themselves; but it may be noted that the same agent may, under different circumstances, be regarded from more than one of these points of view. Thus, while the wind may blow loose sand against the face of a sandstone rock so as to disintegrate it and undermine it, it may also transport sand across the desert and reconstruct this débris removed from one spot into a bed of loess at another. So, too, the roots of plants may enlarge the crevices in rock both mechanically and chemically, so hastening its disintegration; or, binding loose sand together, they may preserve it from the disintegrating effect of wind. As we know of no actual addition to the amount of each chemical element in the world, nor of any means by which it can be destroyed, we can only properly speak of disintegration and reconstruction.

Denudation.—Disintegrating agencies may split up and even pulverise hard rocks, carrying away the materials of which they are composed, and thus laying bare new surfaces to be acted upon in turn. Their combined action is, therefore, termed *denudation* (Latin, *denudare*, to lay bare). There is, we shall see, a marked contrast in the denuding effects of the atmosphere, rain, and wind on the one hand and that of the ocean on the other. The former is termed *subaërial denudation* (*see* Fig. 1, p. 227), the latter *marine*.

It will, however, be more convenient for us to consider the entire action, preservative or reconstructive as well as denuding, of each class of epigene agent in succession; and we may group them under the five classes, *atmospheric*, *fluviatile*, *glacial*, *marine*, and *organic*.

Atmospheric Action.—Passing over the direct actions of the sun in producing evaporation (*see* Vol. I., pp. 208–9), the convection currents in the atmosphere known as winds (*see* Vol. I., p. 145), and the movements of the ocean (*see* Vol. I., pp. 263–6), we may divide the disintegrating actions of the atmosphere into (i.) those due to sudden changes of temperature, (ii.) that of frost, (iii.) that of rain, (iv.) that of wind, and (v.) its chemical actions.

(i.) In continental or extreme climates (*see* Vol. I., p. 145) the range of temperature within 24 hours, from excessive radiation, is often very great, varying, for example, from over 90° F. at noon to 20° at midnight. These considerable and rapid changes produce corresponding expansion and contraction in the rocks at the surface (as they do in the rails of railways or in glass-and-iron roofs), and, especially as the rocks are not perfectly homogeneous, this cracks them explosively, or causes them to flake or become pulverised. A closely-related agency is that of alternate saturation by rain and desiccation in sunshine, by which some rocks, such as shale, are speedily reduced to powder.

(ii.) Frost, acting mainly through the presence of water in the interstices of rock,* is an agent more general in its action, and one the importance of which it would be difficult to exaggerate. When water freezes, at the moment of its solidification it expands, with an almost irresistible force, one-tenth of its volume—that is, ten measures of water, when frozen, would become eleven measures of ice. The first frost of winter solidifies all the particles of water with which the rocks are soaked, forcing the particles of rock from each other, and when the thaw comes, much of its surface crumbles down. This action is not very visible, because the rain easily transports the fine particles thus separated from the mass. Yet when we consider the vast surface which is annually exposed to a temperature below freezing point, we shall have some idea of the great effect which frost has in assisting the general degrading action which the surface of the earth is ever undergoing; and our estimate will be increased when we know the force which is exercised by the solidifying ice. If a hole be bored in a cannon-ball, and the ball be filled with water, the hole being plugged with a fine-threaded screw, upon causing this water to freeze by immersing the ball in a freezing mixture, the expansive force will be found sufficient to break the ball. In the Canadian forests, often the stillness of the night is broken by a loud report, as some giant tree is rent by the united power of the watery particles expanding on their solidification, under the influence of the first frost of winter.

(iii.) The absence of rain is marked, as in Chili (*see* Vol. I., p. 213), by the presence of soluble alkaline incrustations or efflorescences, produced by the evaporating action of the sun on saline solutions rising up through the soil by capillarity. Its more general presence shows itself chemically in the hydration of anhydrous minerals, and the solution of soluble ones; and mechanically in the loosening of particles from the surface, and their transport to lower levels. If it required proof that the surface of the earth had long been subject to the action of rain, we should find it in the frequent discovery of *rain-prints* in some of the oldest rocks. If a shower fall while tidal mud is yet soft, an impression is made, which the sun may bake into an enduring cast, so that when the next high tide covers the flat the rain-prints are not effaced, but a layer of mud is deposited upon them. In process of time this becomes rock, and when split the rain-prints are exhibited, faithfully registering the fact of the shower, and frequently showing the direction of the wind, by the cavity formed by the drop being deeper on that side to which the drop was driven.

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* It should be remembered that in geology the term "rock" includes loose sand and soft clay equally with limestone or granite (*see* Vol. I., p. 325).

The rust-stains on many exposed rock-surfaces, produced by the formation of hydrous iron-oxides, and the effacement of inscriptions on limestone tombs, especially by the carbonated rain-water of towns, are familiar examples of the chemical actions of rain. The turbidity of streams during rain and the farmer's too familiar experience that "stones grow," *i.e.*, that a fresh supply of them will, even on fallow land, be laid bare by the washing away of the finer material, illustrate its mechanical operation. Stones imbedded in a soft rock may, under the influence of this action, become the protecting capitals, as it were, of a series of *earth-pillars*, constantly heightened by further erosion at their base, and varying in height according to the original position of each stone. Such pillars may be seen in many mountain-valleys, or, on a small scale, on many a gravel-bank; remarkable examples are found near Botzen, in the Tyrol (*see* Fig. 2).

(iv.) The chief disintegrating action of wind is that already mentioned, the cutting and undermining of exposed faces of rock by blown sand. The Toad Rock, near Tunbridge Wells, and the "buttes" of the plains of Wyoming and Colorado are examples of its effects.

(v.) In addition to the hydration and solution just mentioned as due to rain, the oxygen, the moisture, and the traces of carbon dioxide present in air (*see* Vol. I., p. 142) have other similar chemical actions. Beds of anhydrite (anhydrous calcium sulphate) for instance, on exposure, absorb water and become gypsum, and expand in so doing. In felspar, also, the chief constituent of granite, a silicate of aluminium and potassium, the potassium silicate apparently becomes a soluble carbonate, and the aluminium silicate is hydrated into clay; so that the rock may be "rotted," as in some of the Dartmoor granite, to a depth of several feet, and can be dug with a spade. The removal, mainly by percolating rain-water, of the carbonate of lime from our chalk and limestone hills, leaving the residue of clay, "terra rossa," or "clay with flints," is a similar case of "rotting" of rock. So completely is the lime removed that the surface-soil over many limestone districts is absolutely free from that constituent.

The combined effect of atmospheric action upon rocks is known as *weathering*, and it is to it that much of the "earth-sculpture," to which we owe the diversified beauties of scenery, is due; but transporting agents, such as wind and rain, by removing the comminuted rock resulting from weathering, expose fresh surfaces to the disintegrating process.

The formation of the sloping heaps of débris or *talus* beneath a line of cliffs, or of the practically identical *screes* at the foot of steep mountain-slopes, is obviously due to weathering; and reference has been already made to the *loess*, or dust-accumulations formed by wind, in the interior of continents (*see* Vol. I., p. 326). The fertility or barrenness of these tracts will depend mainly upon the climate and the presence or absence of water. As the winds sweep over the deserts, they urge before them clouds of fine sand, which drift here and there, continually altering the features of the landscape, and extending the desert domain by covering the fertile tracts which border on the sandy waste. In such regions the absence alike of water and vegetation precludes the possibility of these sand-hills ever becoming fixed; but this is not the case with that belt of sand which lines the coasts of many maritime countries. Here considerable and permanent changes are effected by the alteration of the *sand dunes* by the wind. The shores of the Bay of Biscay are celebrated for these dunes; the wind blows the particles of sand over the crest of the hill in constant succession, and thus the hill is moved. The dunes of Biscay often advance sixty or seventy feet in a year, covering with irresistible encroachments farms and villages, and are sometimes as much as 300 feet high. In many parts of the world this process is in action. When a covering of vegetation springs up on the surface of the hill, all further advancement is prevented, and the dune becomes permanently fixed. Such hills are distinguished by the name of *Eluvium* or *Æolian* accumulations (so called from Æolus, the god of the winds, according to the old Greek and Roman mythology).

Just as wind forms such isolated rocks as the

Toad Rock, and rain forms earth-pillars, so shall we see that isolated rock-*stacks* may result from the unequal action of the waves of the sea upon its coast, and so also the heaped-up masses of granite that form the pinnacle-like *tors* of Dartmoor and other similar districts are due mainly to the decay of part of the granite under the influence of weathering. Other detached rock-masses, such as the hard ferruginous sandstone lump known as the Agglestone at Studland in Dorset, or the limestone Devil's Chimney, near Cheltenham, have had a similar origin.

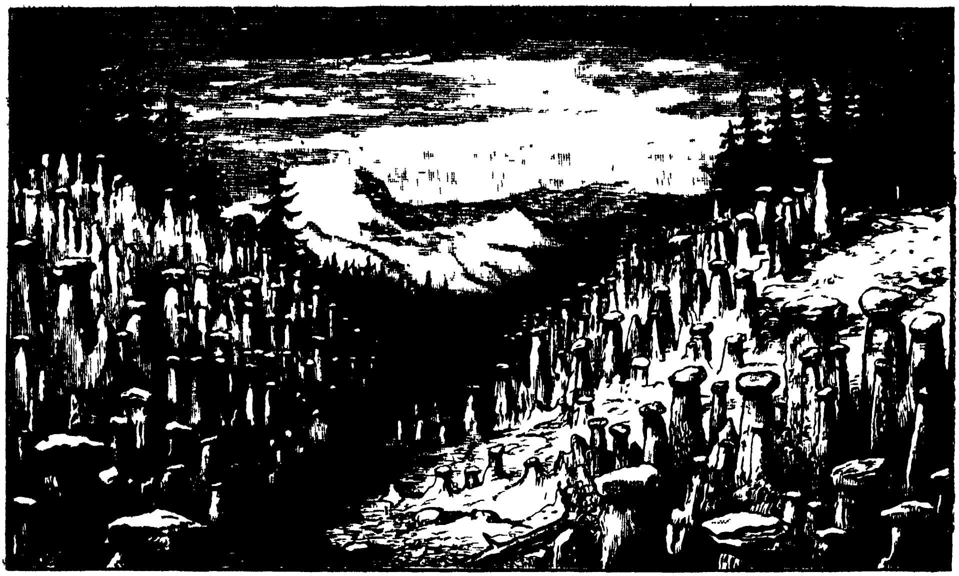

Fig 2—THE EARTH-PILLARS OF BOTZEN.

Soft rocks such as clays or sands may wear down under the action of denuding agencies into plains or broad low-lying valleys. The Vale of Gloucester and Evesham, the Vale of Oxford, the Vale of Aylesbury, and the Fenland, for instance, are all clay-areas, whilst the undulating plains of the Bagshot Heath and the New Forest districts are composed of loose sand. Hard rocks, on the other hand, resisting denudation, appear at the surface, or *crop out*, as it is termed, in cliff-like lines of steep-fronted hills known as *escarpments*. Such are the line of the limestone Cotswolds, the chalk Chilterns, and the North and South Downs. Escarpments differ from river-cliffs or sea-cliffs (i.) in being each composed throughout their extent of one kind of rock, instead of varying perhaps in short distances; (ii.) in being composed of beds apparently horizontal all along their *outcrop*, that is, where they crop out, instead of having the beds exposed tilted at various angles; (iii.) in not having their base at one uniform level, such as sea-level; and (iv.) in having no marine shells or shingle at their feet. If we stand in the churchyard at Lympne, near Hythe, Kent, we can see the contrast remarkably illustrated. The coast has been raised; and from Rye, past Appledore, we see the line of sea-cliffs, which extend from Hastings, now sweeping inland behind Romney Marsh and continuing behind the town of Hythe to Sandgate and Folkestone. Then looking westward we see the escarpment of the Kentish rag limestone stretching as a line of hills from Lympne past Ashford, parallel with the chalk escarpment of the North Downs from Abbot's Cliff inland.

Fluviatile Agencies.—The Chemical Action of Water.—Under the general term fluviatile agencies (Latin, *fluviatilis*, flowing) we include all the varied effects of running water whether on the surface or underground, the action of the mere runnel of rainwater or of the bubbling spring equally with that of the river. The disintegrating and transporting effects of these very important agencies can hardly be separated; but their combined action may be conveniently considered as either chemical or mechanical. Though, no doubt, streams of fresh water, especially when containing acids resulting from the decay of peat or other vegetable matter, do exert some chemical influence in eating into their banks, the chief chemical action of water (apart from the hydration of felspar into kaolin or porcelain-clay) is performed underground. Percolating through rocks, water must dissolve any soluble mineral substances with which it comes in contact, such as common salt and gypsum. The solution of rock-salt containing compressed gaseous paraffin is supposed to be a cause of naphtha-springs and of some mud-volcanoes. The solvent power of water is, however, immensely increased when it contains carbon-dioxide, or other acids resulting from organic decay, which rain-water obtains from the air and from vegetable mould. This is especially seen in three classes of actions: (i.) the solution of limestone; (ii.) the solution and precipitation of silica; (iii.) the reduction of iron oxides, metallic sulphates, and other salts.

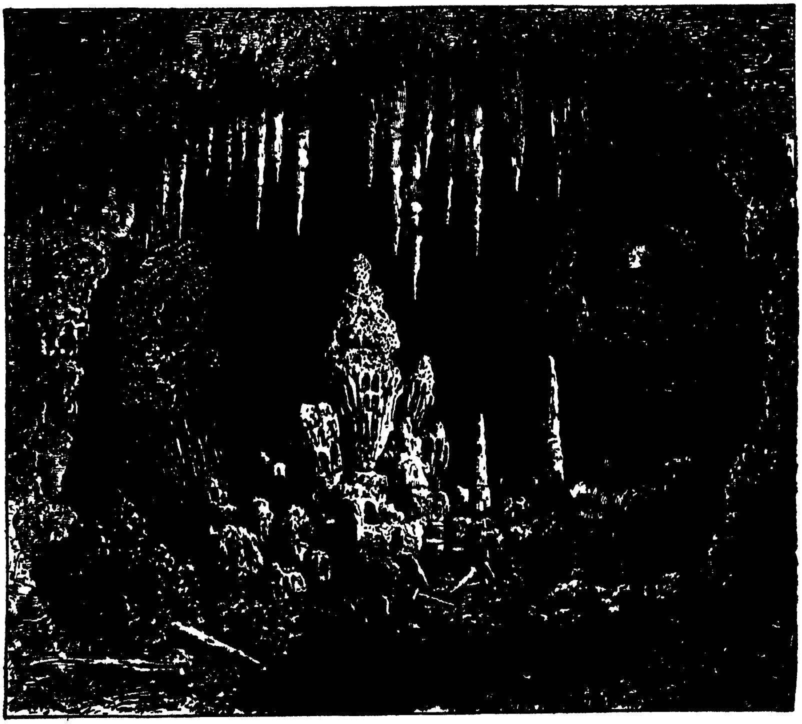

Fig. 3. -Cave of Antiparos.

(i.) *Solution of Limestone.*—Limestone is insoluble in pure water; but when carbon-dioxide is present it is converted into the soluble bi-carbonate, which is removed as *temporary hardness* in the water. It is in this way that percolating waters have dissolved out most caverns, which are especially frequent in limestone. On evaporation by exposure to the air, just as when heated, the carbon-dioxide gas is given off and the carbonate of lime is deposited, forming the "fur" or "boiler-crust" in boilers, the stalactites and stalagmites in caverns (*see* Fig. 3), or the *travertine*, or fresh-water limestone often known as *tufa*, or *calc-sinter*, of so-called "petrifying" springs. One of these springs near Clermont, in Auvergne, has formed an incrustation of white concretionary limestone 240 feet in length and sixteen feet thick. There is a noted mineral spring at San Filippo, in Tuscany, from which a deposit of a foot in thickness can be obtained in four months; hence we are not surprised to find that the spring has formed on the side of the mountain a deposit a mile and a quarter in length, a third of a mile in breadth, and often 250 feet thick. This stone, said to take its name from Tivoli, the ancient Tibur, is much used in building in Italy, the Coliseum being built of it. It is formed in small quantities by springs in Kent, and has been used in some of the churches in that county. The icicle-like pendants from the roofs of caverns, known as stalactites, originate as a ring of lime round an evaporating drop, are lengthened into hollow tubes and thickened by deposit on the outside. They have a radiating crystalline structure, and may extend to the floor, forming massive pillars. It is important to bear in mind that the rate at which they, and the layers of stalagmite on the floor, are formed may vary widely even in one cave, being more rapid under a fissure and perhaps ceasing altogether when clay covers the limestone above. It cannot, therefore, be well used as a measure of time.

(ii.) *Solution of Silica.*—Silica, though generally most insoluble, is dissolved (*a*) by hot water, such as that of geysers, from which it is precipitated on evaporation as ***siliceous sinter;*** (*b*) by alkaline solutions; and (*c*) when in a "colloid" (or non-crystalline) condition. The acids resulting from the decay of organic matter, known as the *humic* acids (Latin, *humus*, soil), cause the precipitation of silica, probably by neutralising alkaline solutions, the deposit often taking place round some decaying plant or animal or in the hollow left by its removal. Woody plant-stems, for instance, are often replaced particle for particle by colloid hydrated silica or *opal*, so that every microscopic detail of their structure can be traced. Decayed parts of the same stems are sometimes replaced by crystalline silica.

(iii.) *Reduction of Oxides, &c.*—Sandstones, or other rocks, of a reddish colour from the presence of ferric oxide, are frequently either changed to a yellow or brown hue from the hydration of the iron oxide; or are bleached, either throughout, as in our silver sands, or in patches, as round decaying roots, through the reduction of the ferric oxide into ferrous oxide by the organic matter, which has an affinity for oxygen. The hydrated ferric oxide is precipitated in marshes as ***bog-iron-ore*** or ***moor-band-pan.*** So also iron sulphate in solution, giving to water the inky taste known as ***chalybeate,*** is reduced by organic decay into iron di-sulphide, or ***pyrites,*** which very commonly replaces the structures of fossil plants and animals. In contact with gypsum, water containing organic matter will give rise first to calcium sulphide and then to limestone and sulphuretted hydrogen, the latter by oxidation forming water and a precipitate of sulphur. Other metallic salts, such as silver and copper oxides, are sometimes so reduced to native metals in the presence of organic decay that wood or bones may be entirely replaced particle for particle by pure metal.

The Mechanical Action of Water.—The mechanical actions of running water in washing particles, loosened by sun, frost, worms, or other agencies, off the surface, in deepening the channels, undermining the banks, or cutting back the ravines of streams, forming waterfalls, cañons, and pot-holes, have been already sufficiently alluded to. It is important, however, to remember that all this visible removal of sediment which renders our rivers turbid, especially after rain, is in addition to the invisible chemical work of solution which we have just described; and also that rivers are constantly rolling large stones and pushing quantities of mud along their beds as well as carrying fine sediment in ***suspension,*** as it is termed. Of 363 million tons of sediment, for instance, which the Mississippi is estimated to carry annually, 50 million are thus pushed along its bed. The amount of material transported, and its composition, varies greatly in different rivers, and at different seasons even in the same river. The nature of the sediment must be entirely determined by the mineral character of the rocks of the country drained by the river. For instance, the colour of the Mississippi is not the same as that of the Arkansas and Red River. The mud which the Indus brings down is of a clayey hue, while that of the Chenab is reddish, and of the Sutlej paler; so that from the deposit of a river the geological character of the country it drains may be determined. From the sediment with which the Nile fertilises Upper Egypt the nature of the mountains of Abyssinia, whose rainfall feeds the "Blue Nile," is plainly indicated. Of the matter in solution about one half will commonly be carbonate of lime, and sulphate of lime will be one of the chief remaining ingredients. The Thames, for instance, carries down 180,000 tons of sulphate, and more than four times as much carbonate, in the year. Variations in the slope of a river and in the rainfall affect its velocity. The mechanical force of water depends upon its velocity, and it increases as the sixth power of that velocity—that is to say, if the velocity be doubled, the motive power becomes sixty-four times greater; if trebled, the transporting force is increased by 729 times. This will readily account for the masses of rock which are known to have been transported by floods. Frequently bridges are borne down by a swollen river, and the blocks of which breakwaters were composed removed many yards by the force of a storm; but the great work carried on by rivers is not by the spasmodic efforts of a flood, but by the continued load of mud which they carry down to the sea.

Reconstructive Action of Rivers—River Terraces. —The reconstructive action of rivers is seen in the deposits of brick-earth or loam, their finer sediment, spread out over their whole flood-plain; in the production of gravel terraces by the deepening and narrowing of their channels; and in the formation of deltas. A succession of terraces, not generally exceeding three in Europe, but more numerous in America, mark apparently a succession of elevations of the land, increasing the slope and therefore the scour, but narrowing the channels, of rivers, which thus cut down through the gravel deposited by themselves. It should be noted that, in such a series, the highest terrace is the oldest, though in any one terrace the materials at the top were the last to be deposited. Though older beds thus occur at higher levels than younger ones, in no case will they be found actually resting upon those younger ones.

Deltas.—Of the formation of a delta an admirable instance is offered to us in the Lake of Geneva. At the upper end of the lake the Rhone enters discoloured by mud; but when it leaves the lake its waters are a transparent blue—the mud has been deposited in the lake. As this has been going on for centuries we may expect to find some evidence of the work of the river. This is given us in the alluvial tract which stretches from the head of the lake for some six or seven miles. It is a marshy plain, higher than the level of the water, and occupying what was once the bed of the lake. If this state of things continue, the Rhone will entirely fill up the lake. The rate of the advance of the delta may be gathered from the fact that the Roman town, Portus Valesia, which stood on the margin of the lake, is now more than a mile and a half inland, the river having added to its delta this quantity in about eight centuries. The delta of the Mississippi has an area of 12,300 square miles. The river brings down $\frac{1}{1321}$ of its weight of solid matter, or more than 6,000,000,000 cubic feet annually; yet such is the vast size of the delta, that Sir Charles Lyell computes it has been in the course of formation for 33,500 years. The Ganges performs even a greater work of transportation. In the four rainy months, at 500 miles from its mouth, it was found to bear seawards 577 cubic feet of solid matter a second! Its annual discharge has been computed to be 6,368,077,440 cubic feet — an amount of matter equal in weight to sixty Great Pyramids of Egypt, although the base of that immense pile covers eleven acres, and its apex is 500 feet above the level of the plain. Yet even this does not measure the deposition which is going on in the upper part of the Bay of Bengal, for the Brahmapootra, in all probability, contributes as much as the Ganges to the sedimentary accumulation. The construction of a delta depends very much upon the position of the river's mouth. If the points of its embouchure be swept by an ocean current, the sediment has no time to settle, but is carried out to sea, where it gradually subsides along the path of the current, while its lighter particles tint the water for thousands of miles. This is the case with the Amazon, the Rio de la Plata, the rivers of Britain and Western Europe. If the river itself be very swift, or if it has recently been filtered by passing through a lake, it may not form any delta at its mouth. The deposition made by rivers has not only an effect in forming deltas, but also tends to elevate their own channels. This is remarkably exhibited in the case of the Po and the Adige. Slowly traversing the flat plain of Lombardy, the Po deposits much of the sediment it carries in its own channel, before its waters reach the sea. The effect of this is to raise the water-course above the surrounding country; frequently its banks have given way, causing terrible destruction, and the river has found for itself a new channel. To diminish the probability of these inundations, each succeeding spring the bed of the river is dredged, and the mud added to the banks. The consequence is that the rivers run like aqueducts, much above the level of the plain. At Ferrara the surface of the Po is higher than the roofs of the houses; but at the same time this has the effect of narrowing the river's channel, thus enabling the waters to carry more of the sediment to the sea; so that the delta now gains seventy metres a year, whereas, 200 years ago, it seems only to have been increased by an annual addition of a third of this quantity. The increase of the delta is rendered evident by the fact that the town of Adria, which gave its name to the gulf, was a seaport in the time of Augustus, whilst now it is twenty Italian miles from the coast. Some indication of the thickness of this alluvial deposit was given by boring an Artesian well at Venice. At a depth of 400 feet the same kind of matter was brought up as that which is now in course of deposition.

GERMAN. — XI.

[*Continued from page* 238.]

THE COMPARISON OF ADJECTIVES (*continued*).

EXAMPLES.

Das Wetter iſt heute kälter, als geſtern.	The weather is colder to-day than yesterday.
Der e'delſte Menſch iſt nicht immer der glück'lichſte, und der reichſte nicht immer der wei'ſeſte.	The noblest man is not always the most fortunate, and the richest not always the wisest.
Der Klügſte iſt gewöhn'lich am beſchei'denſten, der Dümmſte am zu'dringlichſten.	The wisest (man) is generally the most modest, the most stupid the most obtrusive.

Ein guter Feldherr muß mehr klug, als tapfer ſein.	A good commander-in-chief must be more prudent than valiant.
Dieſes Tuch iſt beſſer, als jenes.	This cloth is better than that.
Hunger iſt der beſte Koch.	Hunger is the best cook.
Die Tanne iſt der höchſte Baum.	The pine is the highest tree.
Weisheit iſt mehr zu ſchätzen, als Reichthum, aber am meiſten Tugend und Frömmigkeit.	Wisdom is more to be prized than riches, but virtue and devoutness the most.

VOCABULARY.

Blume, *f.* flower.
Buche, *f.* beech.
Dick, thick, stout, corpulent.
Eiche, *f.* oak.
Ein'fluß, *m.* influence.
Ein'förmigkeit, *f.* uniformity.
Ei'telkeit, *f.* vanity.
Entfernt', distant.
Florenz, *n.* Florence.
Fruchtbar, productive.
Gebil'det, educated, cultivated.
Gefal'len, *m.* pleasure.
Geiſt, *m.* spirit, mind.
Gewöhn'lich, commonly.
Jungling, *m.* youth.
Klugheit, *f.* prudence.
Landluft, *f.* country air.
Luft, *f.* air, atmosphere.
Muth, *m.* courage.
Ovid', *m.* Ovid.
Paris', *n.* Paris.
Parma, *n.* Parma.
Plaudern, to prattle.
Rom, *n.* Rome.
Schrift'ſteller, *m.* writer, author.
Sitte, *f.* custom, *in plur.* manners.
Stamm, *m.* stock, trunk.
Stern, *m.* star.
Um'gehen, to associate.
Unrein, impure.
Un'würdig, unworthy.
Verän'derung, *f.* alteration, change.
Verſtand', *m.* understanding.
Virgil', *m.* Virgil.
Wohlthat, *f.* benefit.
Würdig, worthy.
Zinn, *n.* tin.

EXERCISE 48.

Translate into English :—

1. Dieſer Jäger hat einen ſchönen Hund, meiner iſt ſchöner, und der eurige iſt der ſchönſte von allen. 2. Die Erde iſt kleiner, als die Sonne; und die Sterne ſind entfernter, als der Mond. 3. Virgil iſt ein angenehmener Schriftſteller, als Ovid. 4. Die Stadt Canton iſt größer, als Paris. 5. Alexander der Große hatte weniger Klugheit, als Muth. 6. Man findet viel mehr Kupfer als Silber, und mehr Eiſen als Zinn. 7. Dieſes Mädchen plaudert mehr, als ſie arbeitet. 8. Die Luft in den Städten iſt unreiner, als die Landluft. 9. Frankreich iſt nicht ſo fruchtbar, wie Deutſchland. 10. Dieſer Jüngling hat nicht ſo viel Verſtand, wie ſein Bruder, aber er hat auch nicht ſo viel Eitelkeit. 11. Die Roſe iſt eine der ſchönſten Blumen in der Welt. 12. Diejenigen ſind gewöhnlich am wenigſten ſtolz, deren Geiſt am gebildetſten iſt. 13. Die Sitten derjenigen, mit welchen wir umgehen, haben gewöhnlich Einfluß auf uns. 14. Die Wohlthaten, deren wir würdig ſind, ſind uns angenehmer, als die, deren wir unwürdig ſind. 15. Derjenige iſt der reichſte, deſſen Kinder tugendhaft ſind. 16. Der Herr hat keinen Gefallen an denjenigen Menſchen, die keine Liebe zu ihren Brüdern haben. 17. Der Apfelbaum hat einen dicken Stamm, die Buche hat einen dickern Stamm, und der Eiche hat den dickſten Stamm 18. Je mehr er hat, deſto mehr will er. 19. Florenz iſt ſchöner, als Parma.

EXERCISE 49.

Translate into German :—

1. The more frequent our intercourse is with nations, the more our commerce will be extended. 2. Are the palaces of the kings of England as beautiful as those of the German kings? 3. England is not so fertile as Spain or Italy. 4. It is as easy to do good as to do evil. 5. Virtue is the greatest ornament of man. 6. A sage said (used to say) that the more he reflected on the immortality of the soul, the more important it appeared to him. 7. The Rhine presents the most beautiful view. 8. The country air was more beneficial in the recovery of this youth than the treatment of the most efficient doctor. 9. Ovid is a less agreeable writer than Virgil. 10. The spring is more variable than the autumn. 11. This view is beautiful, but the view from that hill is more beautiful. 12. Augustus was not, perhaps, a greater man than Antony, but he was more fortunate. 13. Of all flowers the rose is the most beautiful, if the violet is not still more beautiful. 14. The society of that youth is less agreeable than that of his brother. 15. Mont Blanc is a high mountain, but Chimborazo is higher, and Mount Everest the highest. 16. Virtue is more to be prized than riches. 17. The soldiers are going to Vienna. 18. The woodcutter cuts down the highest beech in the forest. 19. Rome is the capital of Italy. 20. The stars in the heaven shine brightly. 21. She is more beautiful than amiable. 22. The louder the man called, the faster the boy ran. 23. The boatman rowed rapidly across the river.

INSEPARABLE PARTICLES.

Besides the separable particles, there is another class (be, emp, ent, er, miß, ver, etc.) that, unlike the former, are never used apart from the words to which they are prefixed, and hence are called *inseparable* particles. Thus by the union of these particles be, emp, ent, er, etc., with the verbs fehlen etc., we have the compounds befehlen, empfinden, entbehren, erholen, mißfallen, verhören, zermalmen, etc., corresponding in formation to the English compounds be-tray, de-rive, dis-may, mis-take, etc. With few exceptions (as begeiſtern, beſeelen), however, *German, unlike most English, radical verbs*, may be used as well *alone* as in combination with prefixes—as, ſtören, to disturb; zerſtören, to demolish.

Many particles in German, which are used to modify radical verbs, have their exact equivalents in English, as:—Deuten, to interpret; mißdeuten, to misinterpret; fallen, to fall; befallen, to befall, etc.

An inseparable compound verb does not take the augment ge in the past participle.

Vor, which is often rendered by the English "ago," unlike the latter, always *precedes* the word of time to which it refers, as:—Er war vor zwei Stunden hier, he was here two hours *ago* (literally, he was here *before* two hours).

Seit (since), when used with words denoting time, often answers to "for" or "during," as:—Er iſt ſeit einer Woche krank, he has been (literally, *is*) sick *for* a week; Ich habe ihn ſeit einem ganzen Jahre nicht geſehen, I have not seen him *during* a whole year (a whole year since).

EXAMPLES.

Dieſen ſchönen Kana'rienvogel hat mir mein Vater heute Morgen gege'ben.	My father gave me this beautiful canary-bird this morning.
Die Freunde haben ſich in den Garten bege'ben.	The friends have betaken themselves to the garden.
Die feindliche Armee hat ſich erge'ben.	The hostile army has surrendered (itself).
Der Lehrer hat dem Knaben verge'ben.	The teacher has pardoned the boy.

VOCABULARY.

Ant'worten, to answer (*intransitive*).
Beant'worten, to answer (*transitive*).
Begrün'den, to constitute.
Beſchrei'ben, to describe.
Betra'gen, to behave.
Erfin'den, to invent.
Erhal'ten, to receive.
Ernie'drigen, to lower.
Eſſen, to eat.
Gewit'ter, *n.* tempest, thunder and lightning.
Halten, to hold.
Neſt, *n.* nest.
Paar, *n.* pair.
Reiſe, *f.* journey.
Reiſen, to travel.
Schwalbe, *f.* swallow.
Sich, himself, etc.
Stiefel, *m.* boot.
Stören, to disturb, interrupt.
Tragen, to carry.
Trinken, to drink.
Verſpre'chen, to promise.
Verſte'hen, to understand.
Zeitung, *f.* newspaper, gazette.
Zerſtö'ren, to destroy, demolish.

EXERCISE 50.

Translate into English:—

1. Will Ihr Sohn mein Pferd halten? 2. Er hat es gehalten, aber er hat einen Brief er'alten, welchen er leſen will. 3. Wie hat ſich dieſer Knabe betragen? 4. Er bat ſich gut betragen, er hat meinen Regenſchirm getragen. 5. Die Ruſſen haben einen tapfern Helden gefunden 6. Die Deutſchen haben viele nützliche Künſte erfunden. 7. Dieſer Bettler hat eine Stunde an der Thüre geſtanden, er hat mich nicht verſtanden. 8. Hat der Schuhmacher Zeit, mir ein Paar Stiefel zu machen? 9. Er hat keine Zeit, Ihnen Stiefel zu machen, er hat Andern zu viel verſprochen. 10. Hat der Bauer mehr Kaffee zu trinken, als Brod zu eſſen? 11. Er hat Brod genug zu eſſen und Waſſer zu trinken, aber er hat keinen Kaffee. 12. Haben Sie dieſelben Bücher, welche mein Nachbar gehabt hat? 13. Hat der Matroſe ſeinem Bruder geantwortet? 14. Nein, ich habe ſeinen Brief beantwortet.

EXERCISE 51.

Translate into German:—

1. They have recommended the foreigners to me and to you. 2. There lives in Naples a friend of mine; I shall recommend him to you. 3. One of my friends, whom you have seen with me, has travelled in America, and has written a letter to me, in which he describes his journey. 4. A man of honour lowers himself to [vor] nobody, in whatever condition he may find himself. 5. Did you receive the news before us? 6. I received it after you; the whole neighbourhood too was informed of it, as we received your letter. 7. The children promised their father to be obedient. 8. Advantages may be derived from this invention which nobody can account for.

VARIOUS IDIOMS.

Beide (plural) is declined like an adjective, and, unlike its equivalent (*both*), comes *after* the article or pronoun with which it is used, as:—Die beiden Hände, both the hands; meine beiden Hände, both my hands. Alle (all) is sometimes, for the sake of emphasis, placed *before* beide, and may together be translated "both of them," or simply, "both," as:—Alle beide, both of them, both.

Beides (neut. sing.), which is spelt with a capital, is employed to couple *two* things *different* in kind, whether designated by nouns alike or different in gender, as:—Wem gehört dieſes Meſſer und dieſes Schwert? Beides gehört meinem Freunde, both belong to my friend. Hat Ihnen der Uhrmacher nur die Uhr, oder auch dieſen Ring gemacht? Er hat Beides gemacht, *or*, beide gemacht. Sind Sie mit der Uhr und dem Ring zufrieden? Nein, ich bin mit Beidem unzufrieden, denn Beides iſt nicht nach meinem Wunſche, no, I am dissatisfied with both, for both are not according to my wish.

For the pronoun "neither" the phrase keines *or* keins von beiden is used, as:—Haben Sie das neue oder das alte Buch? Ich habe keins von beiden, I have neither (of the two).

Recht and Unrecht, like the words "right" and "wrong," are nouns, adjectives, and adverbs. The phrases, however, "to be right," "to be wrong," are expressed in German by the *noun*, with the *transitive* verb haben, as:—Er hat Recht, he (*has*) is right; Sie haben nicht Unrecht, you (*have*) are not wrong.

Eben ſo, before an adjective, signifies “just as,” as:—Dieſes Kind iſt eben ſo alt wie jenes, this child is *just as* old as that; Dieſer Mann hat eben ſo viel Klugheit wie Verſtand, this man has *just as* much prudence as understanding.

Ganz wie, with a verb, signifies “precisely,” or “just as,” or “like,” as:—Er iſt ganz wie ich, he is *just as* I (am), he is *just like* me; Sie denkt ganz wie er, she thinks *precisely as* he (thinks), she thinks *precisely like* him.

Noch, besides meaning “nor,” when used in conjunction with weder (“neither”), is variously rendered by “still more,” “another,” “besides,” etc., as:—Er ſchläft noch, he sleeps *still;* Gieb dem Kinde noch Brod, give the child *some more* bread; Wann hat er noch ein Pferd gekauft? when did he buy *another* horse? Einen Apfel hat das Kind gegeſſen, aber es hat noch einen, the child has eaten one apple, but it has one *besides* (*or* another).

Mehr, connected with a negative word, is used like its equivalent “more,” as:—Ich habe keins mehr, I have no more; Ich habe nicht viel mehr, I have not much more. Used with a noun, the adverb *follows*, while in English it *precedes* the noun.

Ander signifies *other*, in the sense of *different*. It must not be used in phrases like, “I saw him *the other day*,” which is in German, Ich ſah ihn neulich (literally, *recently*); *or*, Ich ſah ihn vor einigen Tagen (literally, *a few days ago*).

The neuter anderes, preceded by etwas (in conversation usually contracted to was), is rendered by the phrase “another thing,” as:—Das iſt etwas Anderes, *or*, Das iſt was Anderes, that is another thing.

The *adverb* anders is readily distinguished by its form, and is rendered by “otherwise,” “differently,” etc., as:—Er ſpricht anders, als er denkt, he speaks *otherwise* than he thinks.

EXAMPLES.

Er hat zwei Söhne, aber beide ſind taubſtumm.	He has two sons, but both are deaf and dumb.
Der Rieſe faßte die Keule mit beiden Händen.	The giant seized the club with both hands.
Hat der Kaufmann ein Pferd oder einen Wagen?	Has the merchant a horse or a waggon?
Er hat Beides.	He has both.
Die Wahrheit und die Roſe ſind ſehr ſchön, aber beide haben Dornen.	The truth and the rose are very beautiful, but both have thorns.
Ein auf'richtiger Mann verab'ſcheut eine Lüge.	An upright man abhors a lie.
Faſt jeder Menſch hat e'ben ſo viel Kummer als Freude.	Nearly every human being has as much sorrow as joy.

VOCABULARY.

Ab'fahren, to depart, start.
Ander, other.
Anders, otherwise, differently.
Aus'bleiben, to remain out.
Beide, both.
Beſu'chen, to visit.
Da'bleiben, to remain (there).
Dampfſchiff, *n.* steamboat.
Eli'ſe, *f.* Eliza.
Erlau'ben, to allow.
Freu'denthräne, *f.* tear of joy.
Geleert', empty.
Guſtav, *m.* Gustavus.
Handeln, to act, deal.
Insgeſammt', altogether.
Irren, to err.
Kohle, *f.* coal.
Liefern, to furnish.
Mit'nehmen, to take with.
Mittel, *n.* means.
Muſter, *n.* pattern.
Pennſylva'nien, *n.* Pennsylvania.
Pflaume, *f.* plum.
Reden, to speak, talk.
Rühren, to move, affect.
Sache, *f.* thing, affair.
Som'merrock, *m.* summer coat.
Spazie'rengehen, to take a walk.
Staat, *m.* state.
Thaler, *m.* thaler (a German coin, worth about 3s.)
Trennen, to separate.
Un'angebaut, uncultivated.
Unmög'lich, impossible.
Verſtän'dig, intelligent, sensible.
Waare, *f.* ware, goods.
Weg'nehmen, to take away.
Win'terrock, *m.* winter coat.
Wohlfeil, cheap.
Zu'ſchauer, *m.* spectator.
Zweck, *m.* aim, purpose.

EXERCISE 52.

Translate into English:—

1. Wollen Sie ein Muſter von dieſem oder jenem Tuche haben? 2. Von keinem von beiden. 3. Wir geben ihm einen Thaler für jeden der beiden Männer. 4. Trinken Sie Wein oder Bier? 5. Ich trinke weder Wein noch Bier (*or.* Ich trinke keines von beiden). 6. Sie haben Recht, daß Sie das gethan haben. 7. Iſt es recht, das Johann ſo lange ausbleibt? 8. Nein, es iſt unrecht von ihm, da er ſeine Aufgaben zu lernen hat. 9. Wie viel Tuch braucht der kleine Friedrich zu einem Sommerrocke? 10. Er braucht eben ſo viel, wie zu einem Winterrocke. 11. Der Staat Pennſylvanien liefert eben ſo viel Kohlen, als ganz England. 12. Arbeitet Guſtav nicht eben ſo viel, wie ſein Bruder Hermann? 13. Die kleine Eliſe gab ihrer Schweſter Pauline eben ſo viel Pflaumen, wie ihrer Freundin Emma. 14. Haben unſere Nachbarn noch keinen Garten? 15. Nein, ſie haben noch keinen. 16. Bleiben Sie noch lange auf dem Lande? 17. Ich bleibe noch eine kurze Zeit da, und meine Freunde auch. 18. Gehen Sie heute noch ſpazieren? 19. Nein, denn ich muß noch arbeiten. 20. Die Freudenthränen der lang getrennten Freunde rührten die Herzen aller Zuſchauer. 21. Können Sie die Waaren nicht billiger verkaufen? 22. Es iſt rein unmöglich. 23. Sie müſſen dieſes anders machen. 24. Was kann ich anders thun? 25. Du kannſt anders reden und handeln. 26. Ich werde Sie beſuchen, wenn Sie es erlauben. 27. Er erzählte die Sache ganz anders. 28.

Es iſt etwas anderes, ob ich ſchreibe: er iſt „gelehrt,“ oder „geleert.“

EXERCISE 53.

Translate into German :—

1. Has the teacher taken away the paper or the book? 2. He has taken away both; for both belong to him. 3. Both towns are situated on navigable rivers. 4. They may take either way, as they have proceeded so far. 5. A great part of the land in America is still uncultivated. 6. He who wants the purpose must will the means. 7. The Rhine steamboat has just started for Holland. 8. You err altogether when you say that you have quite surmounted every difficulty, otherwise all that you have stated would be correct. 9. Which of us is right, I or he? 10. You are both wrong. 11. It is quite another thing to say that he was not well, and could not come in consequence of it. 12. I shall speak no more about it; because I have found, upon closer investigation, that he is neither covetous nor prodigal. 13. They do not think themselves better than others. 14. Emma is just as intelligent as Eliza. 15. The sailor sets sail for America to-morrow. 16. Do you drink wine or beer? 17. I drink neither wine nor beer; I always drink water. 18. Gustavus gave the boy a thaler to buy some coals for his mother. 19. Pennsylvania is a rich and flourishing state in the United States of America. 20. She is just like her sister. 21. Give the boy some more plums. 22. I have no more. 23. The girl shed tears of joy when she saw her mother. 24. That ware is cheap, and the pattern of it is beautiful. 25. My friend has purchased a new winter coat. 26. This merchant sends his goods to the town in a waggon. 27. Will you take a walk to-morrow? 28. It is impossible.

PECULIARITIES IN VERBS.

The infinitive of the *active* voice, in certain phrases, is—especially after the verb Sein—often employed in a *passive* signification, as :—Er iſt zu ehren, he is to *be honoured;* Er iſt zu loben, he is to *be praised;* Laß ihn rufen, let him *be called.* This use of the infinitive prevails to some extent in English. Thus, we may translate literally the following examples :—Dieſes Haus iſt zu vermiethen, this house is to let; Dieſer Knabe iſt zu tadeln, this boy is to blame.

Heißen signifies “to name,” “to call;” also, sometimes, “to command.” In the sense of naming or calling, it is most generally used in a *passive* signification, as :—Wie heißen Sie? how *are* you *called?* *or*, what *is* your name? Ich heiße Rudolph, I *am called* Ralph, *or*, my name is Ralph.

EXAMPLES.

Ein böſes Gewiſ'ſen iſt nicht zu beru'higen.	An evil conscience is not to be quieted.
Ein Gelehr'ter iſt leichter zu überzeu'gen, als ein Dummer.	A learned man is easier to be convinced than a stupid (one).
Weisheit iſt nicht wie eine Waare zu kaufen.	Wisdom is not to be bought like wares.
Die Roſe heißt die Kö'nigin der Blumen.	The rose is called the queen of flowers.
Der Löwe heißt der König der Thiere.	The lion is called the king of the beasts.

VOCABULARY.

Aus'ſprache, *f.* pronunciation.
Bei'tragen, to contribute.
Braunſchweig, *n.* Brunswick.
Durch, through, by means of.
Einzig, single, only.
Erklim'men, to climb.
Erler'nen, to learn.
Gewin'nen, to win, gain.
Glück'ſe'ligkeit, *f.* felicity.
Her'ſtellen, to restore, re-establish.
Himmel, *m.* (the) heavens, sky.
Jakob, *m.* James.
Kunſtwerk, *n.* work of art.
Mühe, *f.* pains, toil.
Tulpe, *f.* tulip.
Übung, *f.* practice, use.
Überre'den, to persuade.
Ü'berſchuh, *m.* overshoe.
Verzei'hen, to pardon, excuse.
Vollkom'men, perfect.
Werthvoll, valuable.

EXERCISE 54.

Translate into English :—

1. Dieſe großen, ſchönen Häuſer ſind alle zu vermiethen 2. Das eine Haus iſt zu vermiethen, das andere zu verkaufen. 3. Es iſt nicht zu glauben daß er uns verlaſſen hat. 4. Dieſes Buch iſt bei Herrn Weſtermann in Braunſchweig zu haben. 5. Kein einziger Stern war am ganzen Himmel zu ſehen. 6. Wie iſt dieſes lange Wort auszuſprechen? 7. Wo ſind die beſten Stiefel, Schuhe und Überſchuhe zu finden? 8. Die beſten, die ich geſehen habe, ſind bei meinem alten Nachbar N. zu finden. 9. Das Feuer brannte ſo ſchnell, daß nichts im Schloſſe zu retten war. 10. Nichts Werthvolles iſt ohne Mühe zu gewinnen. 11. Dieſer hohe Felſen iſt nicht zu erklimmen. 12. Dieſes alte Haus iſt nicht mehr herzuſtellen. 13. Durch dieſen Wald iſt nicht zu kommen. 14. Er iſt weder zu überzeugen, noch zu überreden. 15. Sein Betragen iſt gar nicht zu verzeihen. 16. Wie heißt Ihr Freund? 17. Er heißt Jakob. 18. Wie heißt das auf Deutſch? 19. Es heißt eine Brille. 20. Ein Kunſtwerk iſt deſto ſchöner, je vollkommener es iſt, das heißt, je mehr Theile es hat, und je mehr alle dieſe Theile zum Zwecke beitragen.

EXERCISE 55.

Translate into German :—

1. The pronunciation of foreign words is only to be acquired through practice. 2. Nothing is to be learned without pains. 3. Perfect felicity is not to

be found in this world. 4. You speak so quick, that you are not to be understood. 5. Health is not to be bought with money. 6. The peace of the town was not to be restored through severe orders. 7. What do you call these flowers? 8. They are called tulips. 9. The intelligent scholars are to be praised. 10. The difference between to buy and to sell must, by this time, be known to the scholar. 11. This book is to be had of the bookseller C. in London. 12. A valuable work of art cannot be made without much toil. 13. The rose and the violet are valued for their perfume, the tulip for the brilliancy of its colours. 14. James is going to Brunswick to-morrow. 15. The heavens declare the glory of God.

KEY TO EXERCISES.

Ex. 42. 1. Where is the brother-in-law? 2. He sits at the table. 3. Where is the confectioner going? 4. He is going into the bakehouse? 5. Where is his friend, the actor? 6. He is at the opera-house. 7. Where is his friend, the ropemaker, going? 8. He is going into his workshop. 9. Where is the shepherd? 10. He is on the mountain. 11. Where is the shepherd going? 12. He is going on the mountain. 13. Where is our old neighbour going? 14. He is now in the little garden, but he is going into the large garden soon. 15. His wife is in this house, but his cousin is going into that picture-gallery. 16. I stand at the window, and they are coming to the window. 17. The knight already sits upon his good horse, and the servant also is just now jumping upon his good horse. 18. The man sits at the table, and the book lies upon the table. 19. I have no hat on my head. 20. Where is the soldier going? 21. The soldiers are going to the field; they are already on the field. 22. The frog leaps into the river and swims in the river, and the goose swims in the pond. 23. I have read these words somewhere. 24. I can find my cap nowhere, although it must be somewhere in this room.

Ex. 43.—1. Wo iſt die Bildergallerie dieſer Stadt? 2. Wo war jener Herr geboren? 3. Er war in Böhmen geboren 4. Wo wohnt Ihr Freund, der Schauſpieler? 5. Er wohnt in der Stadt. 6. Wo gehen dieſe Auswanderer hin? 7. Woher kommen dieſe Einwanderer? 8. Sie kommen von Frankreich. 9. Wo viel gegeben iſt, wird viel verlangt. 10. Hier dringt nicht die Rache und der gewetzte Dolch eines Verräthers;—unter den Schatten dieſes Baumes kommt kein König. 11. Er warf das Buch vor mir nieder. 12. Wohin gehſt du? 13. Ich gehe zu meinem Schwager. 14. Werden dieſe Auswanderer nach Amerika gehen? 15. Nein, ſie werden hier leiben. 16. Da (or es) iſt Waſſer im Teiche. 17. Woher ommt ſie? 18. Sie kommt von Deutſchland.

Ex. 44.—1. Have you seen my friend? 2. Yes, he has gone own the street. 3. Will you go into the cabin? 4. No, I am ing down below deck. 5. Are you going over to Mainz to-day y the steamboat? 6. Yes, and this evening I shall come by e railroad over the new bridge of boats. 7. Our course is and down. 8. The roe leapt down while the hare ran up e hill. 9. The soldiers sprang out of the barracks, as the emy rushed into the town. 10. As the watchman stepped into the house, the terrified thief hastened down stairs. 11. I cannot get out of the crossways of this garden. 12. Do you not know how this bird got in? 13. Yes, but he does not know where he can get out again. 14. The young Swiss looked towards the blue mountains of his native country. 15. Are you not coming down to-day? 16. Yes, if my uncle comes up, I shall go down. 17. Have you seen this man already? 18. Yes, he entered the door as I went out. 19. The friend went over the river and back again in one hour. 20. The stream falls down the rock with great noise.

Ex. 45.—1. Der Sohn eilte hinunter, ſeinen Vater zu empfangen. 2. Seine Rede dauerte über zwei Stunden. 3. Das Reh ſprang aus ſeinem Verſtecke hervor. 4. Werden Sie heute mit dem Dampfboote nach Frankfurt hinübergehen? 5. Nein, ich werde mit der Eiſenbahn hinübergehen, und mit dem Dampfboote zurückkommen. 6. Gehen Sie nicht über den Kreuzweg hinaus. 7. Ich ſah Ihren Freund hereinkommen, als Ihr Oheim hinausging. 8. Dieſe Leute, welche über jene Brücke gehen, ſind in Gefahr ihres Lebens. 9. Werden Sie heute mit Ihrem Freunde hinausgehen? 10. Von dieſem Hügel können wir nach unſerm Vaterlande hinüberſehen. 11. Wie iſt der Dieb in Ihr Haus gekommen? 12. Eduard ſtürzte ſich von dem Felſen hinab. 13. Ich werde dieſen Morgen an Ihrem Hauſe vorbeikommen, und werde hineinkommen, ohne daß Sie mich bitten, ſolches zu thun.

Ex. 46.—1. Will the aged soldier go to-day in the forest? 2. He will go, but he cannot to-day, because he has much to do. 3. The man-servant is gone into the market to fetch meat. 4. To remain healthy, one must live orderly and temperately. 5. The woodcutter has gone into the forest to cut wood. 6. The butcher goes from one village to the other to buy oxen. 7. He goes from one village to the other, but can find no oxen. 8. What does he want with the oxen? 9. He means to kill them; we must indeed have meat. 10. The peasant has two horses, which the brewer wishes to buy. 11. I go to the city to buy a hat or a cap. 12. He has books to read and an exercise to write. 13. Where does your brother's friend wish to go? 14. He wishes to go nowhere; he wishes to remain with his uncle. 15. Will you go upon the high mountain? 16. I shall go there, but not to-day. 17. Can you go to-morrow into the country? 18. I can go there, but I will not. 19. When does your father want his horses back again? 20. He must have them to-morrow morning, because he wishes to drive to-morrow evening to Frankfort. 21. Why will he not ride there? 22. Because he has no good saddle-horse, and the weather is very cold.

Ex. 47.—1. Es iſt heute zu kalt für ihn, um nach Frankfurt hinüberzugehen. 2. Dort läuft der Haſe über den Berg. 3. Da fährt Ihr Bruder. 4. Der Zuckerbäcker iſt in die Backſtube gegangen, um Brod zu backen. 5. Der Metzger geht auf den Markt, um Schafe zu kaufen. 6. Ihr Kutſcher hat mich ſchnell hierher gefahren. 7: Sehen Sie jenen Mann auf dem Pferde, welches wir geſtern ſahen? 8. Die Soldaten reiten auf ſchönen Pferden. 9. Mann ſagt, in dieſen Kutſchen fährt man bequem. 10. Wir ſind in Ihrem Wagen gefahren, um unſere Viſiten abzuſtatten. 11. Übertritt nicht das Geſetz. 12. Das neue Dampfboot fährt heute zum erſten Male den Fluß hinunter.

BOOK-KEEPING.—III.

[*Continued from p.* 238]

PROFIT AND LOSS ACCOUNTS.

WE propose in this lesson to direct the attention of the student to a class of accounts which may be described as Accounts of Gains, Losses, and Expenses. To this class belong such things as Interest, Commission, Rent, Taxes, Repairs, Insurance, and many others.

All such receipts and payments when in cash involve a double transfer. The business acquires or receives the use of the premises from the landlord, and in return transfers to the landlord so much cash under the name of rent. In book-keeping the business is debited with this use and the landlord credited, and the landlord is debited with cash when the cash is transferred, and the business credited. In the case of taxes, the business receives protection from the Government, and in return parts with a certain amount of cash. The business is debited with this protection, and the Government credited; and the Government is debited with the cash when the cash is transferred, and the business credited. In the case of repairs, the business receives material and labour from a tradesman, and in return gives up so much cash. The business is debited with such material and labour, and the tradesman credited, and the tradesman is debited with cash when the cash is paid to him, and the business credited.

Standing upon pretty much the same footing as rent is the interest paid for borrowed money. Rent is a payment for the use of lands or buildings, interest for the use of cash. In the latter case the business receives the use of the loan, and is, accordingly, debited with it, the lender being credited; for the transfer of cash the lender is debited and the business credited.

The student will not overlook the fact that interest may be receivable as well as payable, and that a similar observation applies to rent. Accounts for interest receivable and rents receivable are credited with the Use of the loan or property when interest or rent accrues due and the account for the person who has enjoyed the Use is debited. When the cash is received, the personal account is credited and cash account debited. An interest account generally includes both receivable and payable interest in the one account.

Reasoning similar to the above applied to all kinds of profit and loss items has led to the enunciation of a general rule for profit and loss accounts — viz., debit losses and expenses, and credit gains or profits.

The nomenclature adopted for a portion of the Profit and Loss group of accounts is likely to confuse the mind of the student; at any rate, unless a word of caution is given him at starting. The names of these accounts are sometimes determined by the nature of the payment, and not, in accordance with the general rule, by the nature of the thing purchased. If we purchase the temporary Use of premises we call the account concerned the Rent account; if we purchase the Use of money we call the account concerned the Interest account; if we purchase Labour we call the account concerned the Salaries or Wages account; and so on, the payment for the thing acquired or obtained being suggested by the name of the account, and not the acquisition of the thing itself. The latter is required to be the prominent idea in settling the book-keeping for such transactions as those now referred to.

We will now take a series of transactions introducing various Profit and Loss accounts, and also the Profit and Loss account itself, or Summary of Profit and Loss. For the sake of obtaining transactions, the nature of which can be readily understood from written explanations, we will suppose W^{m}. Wykeham to enter into business as a hop merchant; and, for the sake of avoiding questions to be taken later on, we will suppose him to begin without a capital.

Jan^{y} 1.—*Bought* 170 *pockets of hops,* "*on credit,*"
of Charles Bunyard, owing him £1,050 : - .

It may be explained that a pocket is a large bag or sack. Hops are sold by weight, each pocket being duly weighed; but it is better just at present to omit all details which may divert the attention of the student from the principles of book-keeping, and we accordingly omit the weights in this lesson.

Here the property transferred is Hops, the transferrer is Bunyard, and the transferree is the Business, represented in this case by the Hops account. We therefore debit Hops and credit Bunyard.

Jan^{y}. 2.—*Borrowed of John Jones, by way of loan,*
at 5 *per cent. interest, and paid into Bank*
of England . . . . . £4,000 : – : –

In this case the property transferred is Cash, the transferrer is Jones, and the transferree, the Business. Debit Bank Cash and credit Jones (Loan).

Jan^{y} 3.—*Sold to Pritchard & Son* 80 *pockets of*
hops, on credit . . . . . £556 : – : –

Debit Pritchard & Son and credit Hops.

be found in this world. 4. You speak so quick, that you are not to be understood. 5. Health is not to be bought with money. 6. The peace of the town was not to be restored through severe orders. 7. What do you call these flowers? 8. They are called tulips. 9. The intelligent scholars are to be praised. 10. The difference between to buy and to sell must, by this time, be known to the scholar. 11. This book is to be had of the bookseller C. in London. 12. A valuable work of art cannot be made without much toil. 13. The rose and the violet are valued for their perfume, the tulip for the brilliancy of its colours. 14. James is going to Brunswick to-morrow. 15. The heavens declare the glory of God.

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Ex. 43.—1. Wo iſt die Bildergallerie dieſer Stadt? 2. Wo war jener Herr geboren? 3. Er war in Böhmen geboren 4. Wo wohnt Ihr Freund, der Schauſpieler? 5. Er wohnt in der Stadt. 6. Wo gehen dieſe Auswanderer hin? 7. Woher kommen dieſe Einwanderer? 8. Sie kommen von Frankreich. 9. Wo viel gegeben iſt, wird viel verlangt. 10. Hier dringt nicht die Rache und der gewetzte Dolch eines Verräthers;—unter den Schatten dieſes Baumes kommt kein König. 11. Er warf das Buch vor mir nieder. 12. Wohin gehſt du? 13. Ich gehe zu meinem Schwager. 14. Werden dieſe Auswanderer nach Amerika gehen? 15. Nein, ſie werden hier bleiben. 16. Da (or es) iſt Waſſer im Teiche. 17. Woher kommt ſie? 18. Sie kommt von Deutſchland.

Ex. 44.—1. Have you seen my friend? 2. Yes, he has gone down the street. 3. Will you go into the cabin? 4. No, I am going down below deck. 5. Are you going over to Mainz to-day by the steamboat? 6. Yes, and this evening I shall come by the railroad over the new bridge of boats. 7. Our course is up and down. 8. The roe leapt down while the hare ran up the hill. 9. The soldiers sprang out of the barracks, as the enemy rushed into the town. 10. As the watchman stepped into the house, the terrified thief hastened down stairs. 11. I cannot get out of the crossways of this garden. 12. Do you not know how this bird got in? 13. Yes, but he does not know where he can get out again. 14. The young Swiss looked towards the blue mountains of his native country. 15. Are you not coming down to-day? 16. Yes, if my uncle comes up, I shall go down. 17. Have you seen this man already? 18. Yes, he entered the door as I went out. 19. The friend went over the river and back again in one hour. 20. The stream falls down the rock with great noise.

Ex. 45.—1. Der Sohn eilte hinunter, ſeinen Vater zu empfangen. 2. Seine Rede dauerte über zwei Stunden. 3. Das Reh ſprang aus ſeinem Verſtecke hervor. 4. Werden Sie heute mit dem Dampfboote nach Frankfurt hinübergehen? 5. Nein, ich werde mit der Eiſenbahn hinübergehen, und mit dem Dampfboote zurückkommen. 6. Gehen Sie nicht über den Kreuzweg hinaus. 7. Ich ſah Ihren Freund hereinkommen, als Ihr Oheim hinausging. 8. Dieſe Leute, welche über jene Brücke gehen, ſind in Gefahr ihres Lebens. 9. Werden Sie heute mit Ihrem Freunde hinausgehen? 10. Von dieſem Hügel können wir nach unſerm Vaterlande hinüberſehen. 11. Wie iſt der Dieb in Ihr Haus gekommen? 12. Eduard ſtürzte ſich von dem Felſen hinab. 13. Ich werde dieſen Morgen an Ihrem Hauſe vorbeikommen, und werde hineinkommen, ohne daß Sie mich bitten, ſolches zu thun.

Ex. 46.—1. Will the aged soldier go to-day in the forest? 2. He will go, but he cannot to-day, because he has much to do. 3. The man-servant is gone into the market to fetch meat. 4. To remain healthy, one must live orderly and temperately. 5. The woodcutter has gone into the forest to cut wood. 6. The butcher goes from one village to the other to buy oxen. 7. He goes from one village to the other, but can find no oxen. 8. What does he want with the oxen? 9. He means to kill them; we must indeed have meat. 10. The peasant has two horses, which the brewer wishes to buy. 11. I go to the city to buy a hat or a cap. 12. He has books to read and an exercise to write. 13. Where does your brother's friend wish to go? 14. He wishes to go nowhere; he wishes to remain with his uncle. 15. Will you go upon the high mountain? 16. I shall go there, but not to-day. 17. Can you go to morrow into the country? 18. I can go there, but I will not. 19. When does your father want his horses back again? 20. He must have them to-morrow morning, because he wishes to drive to-morrow evening to Frankfort. 21. Why will he not ride there? 22. Because he has no good saddle-horse, and the weather is very cold.

Ex. 47.—1. Es iſt heute zu kalt für ihn, um nach Frankfurt hinüberzugehen. 2. Dort läuft der Haſe über den Berg. 3. Da fährt Ihr Bruder. 4. Der Zuckerbäcker iſt in die Backſtube gegangen, um Brod zu backen. 5. Der Metzger geht auf den Markt, um Schafe zu kaufen. 6. Ihr Kutſcher hat mich ſchnell hierher gefahren. *7: Sehen Sie jenen Mann auf dem Pferde, welches wir geſtern ſahen? 8. Die Soldaten reiten auf ſchönen Pferden. 9. Mann ſagt, in dieſen Kutſchen fährt man bequem. 10. Wir ſind in Ihrem Wagen gefahren, um unſere Viſiten abzuſtatten. 11. Übertritt nicht das Geſetz. 12. Das neue Dampfboot fährt heute zum erſten Male den Fluß hinunter.

BOOK-KEEPING.—III.

[*Continued from p.* 233]

PROFIT AND LOSS ACCOUNTS.

We propose in this lesson to direct the attention of the student to a class of accounts which may be described as Accounts of Gains, Losses, and Expenses. To this class belong such things as Interest, Commission, Rent, Taxes, Repairs, Insurance, and many others.

All such receipts and payments when in cash involve a double transfer. The business acquires or receives the use of the premises from the landlord, and in return transfers to the landlord so much cash under the name of rent. In book-keeping the business is debited with this use and the landlord credited, and the landlord is debited with cash when the cash is transferred, and the business credited. In the case of taxes, the business receives protection from the Government, and in return parts with a certain amount of cash. The business is debited with this protection, and the Government credited; and the Government is debited with the cash when the cash is transferred, and the business credited. In the case of repairs, the business receives material and labour from a tradesman, and in return gives up so much cash. The business is debited with such material and labour, and the tradesman credited, and the tradesman is debited with cash when the cash is paid to him, and the business credited.

Standing upon pretty much the same footing as rent is the interest paid for borrowed money. Rent is a payment for the use of lands or buildings, interest for the use of cash. In the latter case the business receives the use of the loan, and is, accordingly, debited with it, the lender being credited; for the transfer of cash the lender is debited and the business credited.

The student will not overlook the fact that interest may be receivable as well as payable, and that a similar observation applies to rent. Accounts for interest receivable and rents receivable are credited with the Use of the loan or property when interest or rent accrues due and the account for the person who has enjoyed the Use is debited. When the cash is received, the personal account is credited and cash account debited. An interest account generally includes both receivable and payable interest in the one account.

Reasoning similar to the above applied to all kinds of profit and loss items has led to the enunciation of a general rule for profit and loss accounts — viz., debit losses and expenses, and credit gains or profits.

The nomenclature adopted for a portion of the Profit and Loss group of accounts is likely to confuse the mind of the student; at any rate, unless a word of caution is given him at starting. The names of these accounts are sometimes determined by the nature of the payment, and not, in accordance with the general rule, by the nature of the thing purchased. If we purchase the temporary Use of premises we call the account concerned the Rent account; if we purchase the Use of money we call the account concerned the Interest account; if we purchase Labour we call the account concerned the Salaries or Wages account; and so on, the payment for the thing acquired or obtained being suggested by the name of the account, and not the acquisition of the thing itself. The latter is required to be the prominent idea in settling the book-keeping for such transactions as those now referred to.

We will now take a series of transactions introducing various Profit and Loss accounts, and also the Profit and Loss account itself, or Summary of Profit and Loss. For the sake of obtaining transactions, the nature of which can be readily understood from written explanations, we will suppose Wm. Wykeham to enter into business as a hop merchant; and, for the sake of avoiding questions to be taken later on, we will suppose him to begin without a capital.

Jany 1.—Bought 170 *pockets of hops, " on credit," of Charles Bunyard, owing him* £1,050 : - .

It may be explained that a pocket is a large bag or sack. Hops are sold by weight, each pocket being duly weighed; but it is better just at present to omit all details which may divert the attention of the student from the principles of book-keeping, and we accordingly omit the weights in this lesson.

Here the property transferred is Hops, the transferrer is Bunyard, and the transferree is the Business, represented in this case by the Hops account. We therefore debit Hops and credit Bunyard.

Jany. 2.—Borrowed of John Jones, by way of loan, at 5 *per cent. interest, and paid into Bank of England* . . . . . £4,000 : – : –

In this case the property transferred is Cash, the transferrer is Jones, and the transferree, the Business. Debit Bank Cash and credit Jones (Loan).

Jany. 3.—Sold to Pritchard & Son 80 *pockets of hops, on credit* . . . . £556 : – : –

Debit Pritchard & Son and credit Hops.

Jan^y. 4.—Bought 500 pockets of hops of Samuel Smith, and paid him by cheque on the Bank of England . . . . £2,820 : – : –

A double transfer occurs here. There is a transfer of hops from Smith to the business, requiring us to debit Hops and credit Smith, and a transfer of cash from the Business to Smith, requiring us to debit Smith and credit Bank Cash.

The account for Smith is debited and credited at the same time, and is thus closed immediately it is opened. For this reason such an account is frequently wholly omitted. Where, however, transactions are large, it is seldom a good plan to forego a record in the personal account of what takes place. A record in the personal account is often convenient for reference in negotiating subsequent purchases or sales, not only with the same person, but also with others.

Jan^y. 5.—Purchased of the owner of the offices and warehouse a lease of the premises for 21 years, subject to an annual rent of £126, and paid him by cheque on the Bank of England £1,094 : – : –

The business secures undisturbed possession of the premises in which it is carried on for 21 years by paying £1,094, "cash down," and £126 a year. The £1,094 may be regarded as the commuted or present value of a portion of the rent, which would otherwise be some £200 per annum, with no fixity of tenure for a term of years to the tenant.

Here again is a double transfer, a transfer or grant of lease or use of premises in the first place, and a transfer of cash in the second; the former gives a temporary property or ownership, made over to the business by the real owner, and the second is effected out of cash at the bank under the order expressed in the cheque. Strictly speaking, the principle of book-keeping requires us to debit the Business and credit the Owner with the lease, and then to debit Owner and credit Bank Cash with the cash. There is, however, nothing to be gained by keeping an account for the owner, especially if, as is usual, a separate account for "Lease" or "Lease of Offices and Premises" is opened. We will, therefore, simply debit Lease and credit Bank Cash with £1,094.

Jan^y. 7.—Drew a cheque and paid wages for the past week . . . . . £3 : – : –

The thing transferred in this case is, firstly, labour, transferred from the workmen to the business; and, secondly, cash, transferred from the business to the workmen. In strict theory, we should therefore debit the Business, represented in this case by an account for Labour, and credit the Workmen; then debit the Workmen and credit Bank Cash. But personal accounts for the workmen, either individually or collectively, are of no use, and are, consequently, not kept. The account for labour is usually named the "Wages" account. As already mentioned, this name is not a good one, because it suggests the payment rather than the thing that is obtained; but it is almost universally adopted. We shall, therefore, debit Wages and credit Bank Cash. Or we may regard the wages in this case as an Expense, and the Wages account as an Expense account; and, in accordance with what has been said before as to debiting expenses, we may say, without further reasoning, debit the Expense account—*i.e.*, the Wages account—and credit Bank Cash.

Jan^y. 8.—Sold 30 pockets of hops to W^m. Barlow, on credit . . . . . £260 : – : –

Debit Barlow and credit Hops.

Jan^y. 9.—Sold 15 pockets of hops to Oscar Olding, also on credit . . . . £110 : – : –

Debit Olding and credit Hops.

Jan^y. 10.—Paid Frank Cox, by cheque, for repairs to Offices and Warehouse . . £6 : 5 : –

The charge for repairs mentioned in the present item is an additional expense incurred by Wykeham, as wholesale merchant or factor, in storing the hops in a central position for the convenience of buyers. It is to the business as essentially a portion of the cost of the hops as the sum paid by the business in purchasing them. Cox's labour is as much a necessity for the protection of the hops as the work of agricultural labourers in the growth of them. We might, therefore, in strict compliance with the principle of book-keeping, debit Cox's labour, as also all other labour, to the Hops account; but such a course is not usually adopted in practice. Just as it was found desirable to keep separate accounts for the various kinds of property, so it is found desirable to keep separate accounts for the several kinds of expense in connection with property; and, for a business like this of a hop merchant, an account may be kept for "Rent, Rates, and Repairs."

Even these three things, closely allied as they are, might be kept apart and dealt with in three separate accounts, and in the books of some large concerns are actually so treated; but in this case such a multiplication of accounts would be entirely profitless. The justification for a separate account exists whenever the separate account tends to afford information that may render the supervision of the business more thorough or the management more effective; but no such justification exists here, and rent, rates, and repairs may be placed together in one account. Collectively, they are the cost of the offices and warehouse.

The item under consideration, though a comparatively insignificant matter, presents a double transfer—the transfer of labour from Cox to the business, and the transfer of cash from the business to Cox. The first, in strict theory, requires us to debit Rent, Rates, and Repairs and credit Cox; and the second to debit Cox and credit Bank Cash. The debit and credit to Cox are, however, usually omitted—a personal account for a jobbing tradesman seldom serving any useful purpose.

Instead of going through all this reasoning, we may regard the cost of the repairs in this case as an expense, and then, in accordance with the rule for treating all expenses, at once say debit Rent, Rates, and Repairs, and credit Bank Cash.

Jany. 11.—Sold 30 pockets of hops to Richard Terping, on credit . . . £247 : 10 : -

Debit Terping and credit Hops.

Jany 12.—Gave Charles Bunyard a bill of exchange, payable at the end of one month from this date. . . . . . £1,050 : - : -

Debit Bunyard and credit Bills Payable.

Jany. 14.—Drew a cheque and paid wages for the past week . . . . . . £3 : - : -

Debit Wages and credit Bank Cash again.

Jany. 15.—Received from Pritchard & Son a cheque for . . . . £256 : - : -
And a bill of exchange for . £300 : - : -
And paid the cheque into the Bank of England.

Here there are transfers from Pritchard & Son to the business of two kinds of property—cash and a bill receivable. We have, therefore, to debit Bank Cash with £256 and Bills Receivable with £300, and to credit Pritchard & Son with the total amount, £556, viz., Cash £256, and Bills Rec. £300.

Jany. 16.—Bought 30 pockets of hops of Samuel Smith, on credit. . . . . £225 : - : -

Debit Hops and credit Smith.

Jany. 17.—Discounted bill receivable for £300. The Bank of England charged as discount £3 : - : -
And placed to the credit of the business banking a/c . . . . £297 : - : -

Here the thing transferred from the Business to the Bank is a bill receivable, and in return the Bank transfers cash (£297) and the use of this cash till the bill falls due. A special bank account is omitted, there being sufficient record of such transactions without it in the Bills account and the Interest account. We have, therefore, to debit Bank Cash and Interest and credit Bills Receivable. With respect to the discount, we may, instead of reasoning as above, regard it as an expense requiring the Interest account to be debited.

Jany 18.—Sold, as agent to the London Hop Coy., a quantity of hops belonging to them, and received a cheque in payment £330 : 15 : -
Our commission on the sale being £8 : 5 : -

Here the property transferred is hops which do not belong to the business, and it is transferred through the business, acting as Agent, from the Company to the purchaser, who in return transfers cash to the business. Omitting in this case the purchaser's account, so as to illustrate a common practice with book-keepers, we have to credit the Company with the value of their hops and debit Bank Cash. We have also to record the benefit transferred to the Company by our agency, and this we do by debiting the Company with its value (£8 : 5 : -) and crediting the Business Commission account.

Or with respect to the commission, we may regard it as a gain, and, like all other gains, requiring to be credited to the account concerned with such gain: in this case, the Commission account.

Jany. 19.—Sold 280 pockets of hops to Truman & Co., and received their bill . £2,000 : - : -

(i.) Debit Truman & Co. and credit Hops; (ii.) debit Bills Receivable and credit Truman & Co.

Jany. 21.—Drew a cheque and paid wages for the past week . . . . . . £3 : - : -

As before, debit Wages and credit Bank Cash.

Jany. 22.—Received cheque from Wm. Barlow, and paid it into the Bank of England for collection . . . . . £257 : 8 : -
Allowed him discount for paying at once £2 : 12 : -

Discount for cash, or trade discount, as it is frequently called, is an allowance partaking somewhat of the nature of interest or bankers' discount, and in many businesses is carried with it to one and the same account. Trade discount, however, is to be regarded more as a provision against bad debt than is the case with bankers' discount or interest; the latter being more especially a recompense for the use of money. The former occurs in every kind of business, the latter depends upon the amount and nature of the capital of the particular business in question. We will, therefore, open separate accounts for Interest (including bankers' discount) and Trade Discounts, observing that there is but little objection to limiting ourselves to one account for the two things.

If we may speak of discount allowed to customers as an expense, we see at once that, in accordance with the rule for treating all expenses, we have to debit it to its account.

Debit Bank Cash and credit Barlow with £257 : 8 : –.

Also debit Trade Discounts and credit Barlow with £2 : 12 : –.

Jany 23.—Drew a cheque and paid rates £6 : 10 : –

This sum is handed to the parish authorities as payment for a due proportion of the labour of the watchmen, the gas company, the road-makers, and paviours, necessary in connection with the offices and warehouse. In a successful business the amount is refunded to the business in the price at which the hops are sold.

Debit Rent, Rates, and Repairs, and credit Bank Cash. The account for the parish, with its equal debit and credit entries, may certainly be omitted.

Or, we may say rates are an expense, and, like all other expenses, require to be debited—the cash in payment requiring to be credited.

Jany. 24.—Drew a cheque and lent Oscar Olding £250 : – : –

Debit Olding and credit Bank Cash. A separate loan account should be kept for Olding, so as to keep apart transactions bearing interest from ordinary trade transactions which do not.

Jan 25.—Sold 205 *pockets of hops to Truman & Co. for cash* . . . . £1,000 : – : –

Debit Truman & Co. and credit Hops; also debit Bank Cash and credit Truman & Co.

Jany. 26.—Received and paid into Bank of England first and final dividend from the estate of Rd. Terping, now a bankrupt £165 : – : –

Debit Bank Cash and credit Terping with this amount. The balance of £82 : 10 : – due from Terping is a loss. Property in hops worth £247 : 10 : – was transferred to him, but in return property in cash amounting to only £165 is received. There remains an unsatisfied transfer to him of business property worth £82 : 10 : –, and by the bankruptcy laws the claim of the business for this sum is now cancelled, and a loss to the business created. All unsatisfied and unsatisfiable transfers or balances on the ledger accounts are elements of profit and loss, and are conveniently, if not necessarily, collected together in one account, called a Profit and Loss account. It will be observed that all unsatisfied debits, whether on personal accounts, property accounts, or profit and loss accounts, represent loss, and all unsatisfied credits gain. We have, accordingly, in this instance, to debit Profit and Loss account and credit Terping's account with £82 : 10 : –.

Sometimes, and more frequently in large businesses, a special account is kept for "Bad Debts," in which are entered all sums found to be irrecoverable.

Jany. 28.—Drew a cheque and paid wages for the week . . . . £3 : – : –

Debit Wages and credit Bank Cash.

Jany. 29.—Drew a cheque and repaid John Jones a portion of the loan owing to him £1,000 : – : –

Debit Jones (Loan a/c) and credit Bank Cash.

Jany 30.—Drew a cheque and paid the Ætna Fire Insurance Coy. for an insurance of the premises against fire . . . £2 : –

(ii.) *Drew a second cheque, and paid the Coy for an insurance of the Hops in stock* £2 : –.

(i.) Here the Company transfers a benefit to the business of the nature of protection. The business is therefore debited, and the Company may be credited. The business may be represented by the Rent account, for an insurance effected under a lease is part of the annual cost, and its cost an expense of the nature of rent, taxes, and repairs—*i.e.*, a part of the cost of the hire of the premises. The transfer of cash requires us to debit the Company and to credit Cash. The Company's account, however, is usually omitted.

(ii.) Here we may say that the insurance should be charged to the Hops account, because its cost is a portion of the cost of the hops to the business; but it is usual to treat it as we treat other expenses in connection with hops, and to open a separate and special account. We will, therefore, debit an "Insurance" account and credit cash, omitting the account for the Company with its equal debit and credit entries.

Jany. 31.—Drew a cheque and paid rent of Offices and Warehouse for the month £10 : 10 : –

The thing paid for is the use of these premises. Debit Rent, Rates, and Repairs, and credit Bank Cash. No account for the landlord is desirable. Or, say, rent is an expense, and therefore a thing requiring to be debited.

Write off for the month a due proportion of the value of the Lease . . . . £6 : - : -

A month of the term covered by the lease has expired, and a corresponding portion of the value of the lease has, by the lapse of time, gone. The lease, at the end of the month, is worth £6 less than at the beginning. This £6 is another form of rent, and, like rent so-called, is a payment for the use of the premises. Debit Rent, Rates, and Repairs, and credit Lease.

Credit John Jones with interest to date £15 : 7 : 6

This entry is a recognition of the fact that Jones has transferred to the business the use of a sum of money for which interest is owing to him, or that an additional expense has been incurred.

Debit Interest and credit Jones.

Charge Oscar Olding with 6 *days' interest* £0 : 4 : -

This is, similarly, to recognise the fact that the business has transferred to Olding the use of a sum of money for which it has a claim against him for interest, or that a gain has been made.

Debit Olding and credit Interest.

After a month's trading Wykeham desires to close his books and ascertain the result. This process involves two distinct operations—(i.) the formation or completion of the Profit and Loss account; and (ii.) the formation, as in the previous lesson, of a Balance Sheet, showing the final state of affairs.

The Hops account has to be credited with the market value to Wykeham, as a purchaser, of the hops remaining on hand, say, £330 : 15 : -. This is entered as the "balance" of the Hops account, and represents the value of the hops with which the following month's trading is recommenced.

The Hops account, then, shows that, after all the hops bought have been sold or allowed for, they have realised £409 : 5 : - more than they cost. This sum is not clear profit, for there are various expenses to come out of it; but it is a factor in determining profit, and we remove it from its present position into the Profit and Loss account. The account for Rent, Rates, and Repairs, the account for Wages, the account for Commission, the account for Insurance, the account for Trade Discounts, and the account for Interest, all present balances which are factors in determining profit and loss, and are therefore all treated in a similar manner—their balances being shifted into the Profit and Loss account.

When the different items forming the Profit and Loss account have been collected, the balance of that account shows the profit or loss that has been made. If, as in this case, the excess or balance is a credit one, a profit has been made of that same sum. If, on the contrary, the excess or balance is on the debit side, the trading has resulted in a loss—the balance in question showing what the loss amounts to.

The Balance Sheet is framed, as in the previous lesson, by taking out the balances of all the accounts now remaining unclosed—the credit balances which represent the liabilities of the business (not of Wykeham personally) being arranged on the first side, and the debit balances, representing the assets of the business, on the second side.

We give the profit and loss accounts below, including the goods account, which, though a property account, also affects profit and loss, and we add to them the Balance Sheet. The student will be able to supply the remaining accounts himself.

HOPS.

1889.		£	s.	d.	1889.		£	s.	d.
Jan. 1	Chas. Bunyard - - -	1,050	-	-	Jan. 3	Pritchard & Son - -	556	-	-
„ 4	Saml. Smith - - -	2,820	-	-	„ 8	Wm. Barlow - - -	260	-	-
„ 16	„ „ - - -	225	-	-	„ 9	Oscar Olding - - -	110	-	-
„ 31	Profit and Loss - - -	409	5		„ 11	Rd. Terping - - -	247	10	-
					„ 19	Truman & Co. - - -	2,000	-	-
					„ 25	„ „ - - -	1,000	-	-
					„ 31	Balance (Hops on hand) -	330	15	-
		4,504	5	-			4,504	5	-
Feb. 1	Balance, brought forward -	330	15	-					

WAGES (= LABOUR).

1889.		£	s.	d.	1889.		£	s.	d.
Jan. 7	Cash - - - - - -	3	–	–	Jan. 31	Profit and Loss - - -	12	–	–
„ 14	„ - - - - - -	3	–	–					
„ 21	„ - - - - - -	3	–	–					
„ 28	„ - - - - - -	3	–	–					
		12	–	–			12	–	–

RENT, RATES, AND REPAIRS.

1889.		£	s.	d.	1889.		£	s.	d.
Jan. 10	Cash - - - - - -	6	5	–	Jan. 31	Profit and Loss - - -	31	5	–
„ 23	„ - - - - - -	6	10	–					
„ 30	Insurance - - - -	2	–	–					
„ 31	Cash - - - - - -	10	10	–					
„ „	Lease - - - - -	6	-	–					
		31	5	–			31	5	–

COMMISSION.

1889.		£	s.	d.	1889.		£	s.	d.
Jan. 31	Profit and Loss - - -	8	5	–	Jan. 18	London Hop Co.. - -	8	5	–

INSURANCE.

1889.		£	s.	d.	1889.		£	s.	d.
Jan. 30	Cash - - - - - -	2	–	–	Jan 31	Profit and Loss - - -	2	–	–

TRADE DISCOUNTS.

1889.		£	s.	d.	1889.		£	s.	d.
Jan. 22	Wm. Barlow - - -	2	12	–	Jan. 31	Profit and Loss - - -	2	12	–

INTEREST.

1889.		£	s.	d.	1889.		£	s.	d.
Jan. 17	Bills receivable - - -	3	–	–	Jan. 31	Oscar Olding (Loan) - -	–	4	–
„ 31	John Jones - - -	15	7	6	„ „	Profit and Loss - - -	18	3	6
		18	7	6			18	7	6

PROFIT AND LOSS.

Losses — *Profits.*

1889.		£	s.	d.	1889.		£	s.	d.
Jan. 26	Rd. Terping	82	10	-	Jan 31	Hops	400	5	-
,, 31	Wages	12	-	-	,, ,,	Commission	8	5	-
,, ,,	Rent, Rates, and Repairs	31	5	-					
,, ,,	Insurance	2	-	-					
,, ,,	Trade Discounts	2	12	-					
,, ,,	Interest	18	3	6					
,, ,,	Balance, carried forward	268	19	6					
		417	10	-			417	10	-
					Feb. 1	Balance, brought forward	268	19	6

BALANCE SHEET

ON THE 31ST JANUARY, 1889.

(Liabilities.) — *(Assets.)*

	£	s.	d.		£	s.	d.
Bills payable	1,050	-	-	Cash at Bank	1,102	18	-
John Jones (Loan)	3,015	7	6	Bills receivable	2,000	-	-
Samuel Smith	225	-	-	Hops	330	15	-
London Hop Co.	322	10	-	Lease	1,088	-	-
Profit and Loss (net)	268	19	6	Oscar Olding	110	-	-
				Oscar Olding (Loan)	250	4	-
	4,881	17	-		4,881	17	-

ENGLISH.—XI.

[*Continued from p.* 257.]

THE VERB: GENERAL PRINCIPLES.

WE have now passed in review the *noun*, the *article*, the *adjective*, and the *pronoun*. We shall proceed to the consideration of the most important part of our subject—namely, the *verb*.

Verb etymologically considered simply means *a word;* the verb is *the word.* The fact seems to imply that the ancients, from whom our grammatical terms come, regarded the verb as the principal word. Whether precedence belongs in reality to the *verb* or to the *noun*, the designation in itself is not descriptive of the nature and functions of the verb. Let us therefore take a verb and study its office:—

Alfred *sleeps.*

Sleeps is a verb. What is its essential character? "A verb," it has been said, "is a word which signifies to be, to do, or to suffer." The definition hardly applies to the statement that *Alfred sleeps.* But *Alfred sleeps* is a statement: a verb, then, may be defined as a word which, together with its subject, makes a statement; the form of words may be shortened and simplified by our saying that a *verb is a word which affirms or declares.* Affirmation, then, is the essence of a verb. All verbs affirm or declare something of their subjects. Put the definition to the test in the following instances: *Alfred is (exists); Alfred is sick; Alfred eats; Alfred reads his lesson; Alfred is reproved.*

In the phrase *Alfred sleeps* we have only two words; of these, *sleeps*, we have ascertained, is a *verb*, and *Alfred*, we know, is a proper *noun.* We also know that *Alfred* is the subject to the verb *sleeps.* The simplest form, then, in which a verb can appear is in a sentence which consists only of a verb and its subject. Now if you look a little closely into the verb *sleeps* you see that what is temperature averages 57° F, and the rainfall 32 inches. Founded in 1835, and now the largest city in the southern hemisphere, it has a University, Mint, Observatory, and Botanical Garden. *Ballarat* [41], to the north-west, centre of the declining gold-digging district. *Sandhurst* [40], or *Bendigo*, farther north, the growing centre of the auriferous quartz region *Geelong* [21], on a harbour in the west of Port Phillip Bay.

SYDNEY, FROM THE HARBOUR

NEW SOUTH WALES, the main boundaries of which are the parallel of 29° S lat on the north, the meridian of 141° E long on the west, and the Murray River on the south, has an area of 310,700 square miles, and a population of 1,042,919 The coast region is well watered and fertile; the tableland of the interior subject to drought. Valuable timber abounds, and fruits of almost all kinds can be grown. Government is in the hands of a Governor, responsible Ministry, Legislative Council of 58 life-members, and Assembly of 122 elected members. There is a naval and military force of 6,052 men. **Sydney** [330], on the magnificent harbour of Port Jackson—12,043 miles, or 33 days, from London, *viâ* the Suez Canal—is in long. 151° 14′ E., being thus about 10 hours fast by Greenwich time, and in lat. 33° 54′ S., approximately that of Valparaiso, in Chili. The temperature averages 62° F, about the same as Madrid, and the rainfall 58 inches. University, Mint, Observatory, and fine Botanical Garden. *Newcastle* [15], at the mouth of the Hunter River, to the north, the centre of the coal trade. *Paramatta* [8], at the head of Port Jackson.

NORFOLK ISLAND, in long 168° 10′ E., lat. 29° S, with an area of 17 square miles, and a population of 663, descendants of the mutineers of the *Bounty*, removed from Pitcairn Island, is attached to the government of New South Wales

QUEENSLAND, in the north-east, bounded by New South Wales on the south, and by the meridian of 141° E long on the west to the parallel of 26° S, and north of that by the meridian of 138° E., separating it from South Australia, includes 668,500 square miles, with a population of 367,000. Half the area is forest; coal, gold, tin, and copper are found in quantity, and maize and sugar are grown; but sheep and cattle are the staple of the colony, the pasture lands being, perhaps, the most fertile in the world. Government is in the hands of a Governor, responsible Ministry, Legislative Council of 37 life-members, and elective Assembly of 72. The colony has a defensive force of 4,000 men, besides reserves. **Brisbane** [73], on Moreton Bay—12,490 miles, or 38 days, from London, *viâ* Suez and Sydney—is in long. 153° E and lat. 27° 30′ S., with an average temperature of 70° F. and a rainfall of 55 inches.

SOUTH AUSTRALIA, including the centre of the continent, extends from the three colonies already described to the meridian of 129° E., comprising 903,690 square miles, with a population of 319,500. There are considerable copper mines, chiefly in Yorke Peninsula, but the colony is mainly agricultural, being "the granary of Australasia." Wheat, the olive, and the vine are largely cultivated. About 200 miles north of Adelaide the dry region of the interior begins. The Northern Territory is rich in minerals, and well suited for tropical agriculture. Government is administered by a Governor, responsible Ministry, Legislative Council of 24, and House of Assembly of 52 members, both elective, there being a Resident in the Northern Territory. There is a force of 3,000 of all arms. An overland telegraph, 2,200 miles in length, connects Adelaide with Palmerston, on Port Darwin, whence there is a cable to India. **Adelaide** [128], east of the Gulf of St. Vincent, with a safe harbour, is 11,100 miles, or 38 days, from London, in long. 138° E. and lat. 35° S.

WESTERN AUSTRALIA, formerly called the "Swan River Settlement," comprises 1,060,000 square miles, with a population of 42,500. Much of the colony is forest, the jarrah being the chief timber. The rainfall averages 26 inches. Gold has recently been found. There is a Governor and a partly elective Legislative Council. **Perth** [10] is at the mouth of the Swan River.

BRITISH NEW GUINEA is the south-east portion of the island, which is only second in size to Australia, containing as it does nearly 306,000 square miles, and is separated from Queensland by the shallow Torres Straits. The west portion belongs to Holland; the north-east, Kaiser Wilhelm's Land, to Germany; and the British territory includes 86,457 square miles, extending eastwards from long. 141° E. and south-eastwards from lat. 5° S. The population is estimated at 135,000, mostly of a black Negrito race known as Papuas. The interior is mountainous and volcanic, and reported as healthier than the coast. There are extensive forests haunted by gay-plumaged birds, such as the Birds of Paradise. It is under an Administrator, **Port Moresby**, on the south coast, being the capital.

TASMANIA, formerly called "Van Diemen's Land," an island south of Victoria, from which it is separated by the shallow *Bass Strait*, 120 miles across, has an area of 26,215 square miles, or less than one-third that of Great Britain, and a population of 142,478. The island is mountainous, well watered, very healthy, with fine scenery and much valuable timber, especially the Huon pine. Among the native animals are the so-called "tiger," the "devil," and the "platypus." The aboriginal inhabitants are extinct. Gold is found, and tin and coal are extensively mined. The soil is fertile, much wheat, oats, and hops, and abundance of jam- and other fruits being produced; but wool is the staple export. The Merino sheep and Devon cattle are esteemed throughout Australasia. The whale fishery is important. There are over 300 miles of railway. Government is in the hands of a Governor, responsible ministry, and two elective Houses of Parliament. **Hobart** [29], on a fine harbour at the mouth of the Derwent, in the south, in lat. 42° 56′ S. and long. 147° 21′ E., is 13,250 miles, or 36 days, from London. *Launceston* [15], on the Tamar, is the northern port, trading with Victoria. The FURNEAUX ISLANDS in Bass Strait are under the Tasmanian government.

NEW ZEALAND, a group of islands, about 1,500 miles E. by S. from Australia, with a united area of 104,000 square miles, or about one-sixth more than Great Britain, and a population of 645,330, of whom about 42,000, chiefly in the North Island, are Maoris, a fine Malay race. Lying between lat. 34° and 47° S. and long. 166° and 178° E., its situation corresponds nearly with that of Italy in the northern hemisphere, but its climate more resembles that of Great Britain. There are two large islands, North Island, 45,687 square miles, and South Island, 57,579 square miles, divided by the tempestuous *Cook Strait*, and Stewart Island, 1,000 square miles, separated from South Island by *Foveaux Strait*. The North Island is largely volcanic, having active and extinct volcanoes, such as Tongariro, 6,200 feet, and Egmont, 8,838 feet, and geysers. In form it is a square with its corners produced, that to the north-west forming a long peninsula north of Auckland. To the north is the *Bay of Plenty* and to the east *Hawke Bay*, on which is the town of *Napier* [8]. South Island has a mountain range, the Southern Alps, down its west side, with large glaciers, and culminating in Mount Cook, 12,349 feet. Lakes are numerous, *Taupo*, in the centre of North Island, being the largest; but, though there is an abundant water-supply, the rainfall averaging 30 inches, the rivers are necessarily short. The mean summer temperature is 63°, that of winter 48° F., so that all British plants can be grown. The valuable Kauri pine, yielding masts and gum, grows in the north, and the so-called New Zealand "flax" is a strong fibre used mainly for cordage. Coal, gold, and copper occur in several districts. There were apparently no indigenous mammals, the rat and the Maori dog not being so; but rabbits have become a pest in South Island. Some of the birds are remarkable, especially the recently extinct gigantic Moa and the little wingless Ki-wi. Sheep-farming is the chief industry, wool, exceeding three million sterling per annum, frozen mutton, and tallow, being, with gold, gum, and timber, among the chief exports. Government is administered by a Governor, ministry, nominated Legislative Council, and elective Assembly. There are 2,000 miles of railway, mostly governmental. The examining New Zealand University has affiliated to it the teaching Otago University, Dunedin; Canterbury College, Christchurch; and University College, Auckland. **Wellington** [30], on Port Nicholson, north of Cook Strait, in long. 174° 48′ E., is 11½ hours fast by Greenwich, and is 16,000 miles, or 38 days, from London. *Auckland* [59], on the isthmus of Hauraki Bay, a former capital, the port of the north, 1,260 miles from Sydney. *Dunedin* [47], on Port Otago, a fine harbour. *Christchurch* [46], to the north of the fertile Canterbury plains.

AUCKLAND ISLANDS, to the south, CHATHAM ISLAND, to the east, and KERMADEC, to the north, are annexed to New Zealand.

THE FIJI ISLANDS, a volcanic group of over 200 islands, about long. 180° and lat. 18° S., 1,100 miles north of New Zealand, have a total area of about 8,000 square miles, with a population of 129,000. They produce bread-fruit, bananas, cocoa-nuts, cotton, arrowroot, bêche-de-mer, &c. The two larger islands are Viti Levu and Vanua Levu. There is a Governor with Councils. **Suva**, on Viti Levu, is 11,000 miles, or 50 days, from London. ROTUMAH, to the north, is annexed to Fiji. The British Government exercise a protectorate over the TONGA ISLANDS, to the east, and claim the ELLICE ISLANDS, in lat. 8° S.; CAROLINE ISLAND, near lat. 10° S., long. 150° W.; FANNING, lat. 4° N., long. 158° W.; MALDEN, lat. 4° S., long. 155° W.; and the STARBUCK ISLANDS, lat. 5° S., long. 155° W. (*See* Vol. I., p. 76.)

ANTHROPOLOGY.—III.

[*Continued from p.* 251.]

THE ARYAN RACE.

EUROPEAN SECTION.—The dominant races of Europe are nearly all Aryan. Those of them which are so, when arranged according to their languages, fall naturally under six subdivisions:—(1) The Teutonic; (2) the Celtic; (3) the Slavonic, or Windic; (4) the Italic; (5) the Illyric; and (6) the Hellenic races.

The *Teutonic* race is one of a very remarkable character. It has never been properly subdued. While several other European races were so thoroughly brought under the sway of Rome that they lost their native languages, and now speak tongues in which Latin words predominate, the Teutons maintained their political independence, and kept their speech virtually unmodified by their proximity to the all-conquering empire. Next, ceasing to act simply on the defensive, they began to assail the colossal Roman dominion itself; and finally under the names of Ostrogoths (East Goths), Visigoths (West Goths), Vandals, etc., they burst in upon the effete empire and trampled it under foot. Decay and death in this world of God's are designed to be the prelude to new life, and the overthrow of the old civilisation—though its immediate result might be ages of confusion and intellectual darkness—yet was followed at last by the birth of a new and better culture than that which had perished. How closely the destroyers of the Roman empire were akin to the modern Teutonic nations—our own, for example—will be apparent from a glance at one or two of the half-English names applied to their tribes or armies: thus, the Romans spoke of the Marcomanni, that is, "the men of mark;" and the Alemanni, or "all men," showing the miscellaneous nature of the assemblage which desire of plunder had drawn together. Germany was the great seat of the Teutonic tribes: their boundaries, when the Romans first came in contact with them, being the Rhine on the west, the Danube on the south, the Vistula on the east, and on the north a line running in some unknown latitude across Scandinavia.

The classical authors of antiquity describe the Germanic tribes as tall in stature and strong in body, with a fair complexion, yellow, or more frequently red hair, and blue eyes. But, remarkably enough, these characteristics are not now common in Germany; to find them extensively diffused one must repair to Scandinavia. In Germany the hair and eyes in a vast number of instances are dark, owing to crossing with the southern races with which the Germanic barbarians came in contact, and to the enormous infusion of Jewish blood which of late years has been poured into the veins of Germany. It is a curious fact that the fair type is the least persistent one among the Aryan races, and that all the fair-complexioned peoples gradually approximate to those of a darker hue. "At the time the 'Vedas' were written," says Dr. Robert Brown, "it does not appear that the Hindoo race was so dark as now. In these sacred writings the people figure as 'white-complexioned.'" The nearer we get to the original country of the Aryans in Central Asia, the whiter do the people become. The darkening of the Asiatic Aryan is, therefore, held to be due to intermarriage with the swarthy Southern races he displaced; and, by parity of reasoning, the same explanation, together with Semitic immigration, will serve to account for the darkening of the Germanic nations. Latham thus describes the physical conformation of the entire Teutonic, or, as he calls it, "Gothic" family: (*a*) "Blue eyes, flaxen hair, ruddy complexion, smooth skin, fleshy limbs; (*b*) Eyes grey, dark, or hazel; hair brown or black; complexion sallow or swarthy; bulk varied."

If the classification of the several Teutonic tribes and sub-tribes be founded on language, then this great race will be resolved into three smaller ones —the High German in South Germany, and speaking German proper; the Low German in the British Islands, Holland, and Friesland, speaking English, Dutch and Frising; and the Scandinavian sub-races in Denmark, Sweden, Norway, and Iceland, speaking Norse. Besides these three Teutonic families speaking living tongues, there was a fourth —the Goths—who spoke what is now a dead language.

The *Celtic* is the second of the great races now inhabiting Europe. Even before the conquests of Julius Cæsar, the Romans had become well acquainted with one great section of it, namely, the Gallic tribes, who had frequently burst through the Alps, and rolled an invading torrent like an avalanche down upon the plains of Italy. These aggressive Celts, too, had so well held their own in that peninsula, that there was a Cis-Alpine as well as a Trans-Alpine Gaul; that is, a Gaul on the south as well as one on the north of the Alps. Hence the Latin authors have left behind them in their writings sundry interesting notices with respect to the physical and mental qualities of the Celtic tribes. One of these, dashed off with a free pen, is by Ammianus Marcellinus, who flourished in the latter part of the fourth century, and whose observations with respect to Celtic peculiarities possess a special value from the fact that he was a Roman military officer who, it is believed, spent a considerable period in Gaul.

"The Gauls," says Ammianus, "are almost all tall of stature, very fair, and red-haired, and horrible from the fierceness of their eyes; fond of strife, and haughtily insolent. A whole band of strangers would not endure one of them, aided in his brawl by his powerful and blue-eyed wife, especially when with swollen neck and gnashing teeth, poising her huge white arms, she begins, joining kicks to blows, to put forth her fists, like stones from the twisted strings of a catapult. Most of their voices are terrific and threatening, as well when they are quiet as when they are angry. All ages are thought fit for war, and an old man is led out to be armed with the same vigour of heart as the man in his prime, with limbs hardened by cold and continual labour, and a contempt of many even real dangers. None of them are known, like those who in Italy are called in joke Marci, to cut off their thumbs, through fear of serving in war. They are as a nation very fond of wine, and invent many drinks resembling it, and some of the poorer sort wander about with their senses quite blunted with continual intoxication."

Other ancient authors concur with Ammianus in representing the Gallic Celts as having blue eyes and fair or red hair. The people of Britain, again, were said to be of a feebler physical type, and one tribe—the Silures—was reported to be swarthy in colour, and to have dark curly hair. Here, then, we are met by a difficulty. The Celtic tribes are not to any large extent characterised at present by blue eyes and fair or red hair. A good many of them are dark; and if the observations made by Ammianus and others were trustworthy—as they appear to have been—then some change must have taken place among the Celts, as among the Germans, within the last two thousand years. Dr. Latham, following Retzius, considers the Celtic skull as one of remarkable length. He further describes the race as having prominent cheek-bones; while as to the colour of the hair and eyes, he institutes two divisions:—(1) The Silurian type: "Eyes and hair black; complexion dark with a ruddy tinge: chiefly found in South Wales. (2) The Hibernian type: eyes grey; hair yellow, red, or sandy; complexion light." The race, as proved by a study of the languages peculiar to it, should be divided into two sub-races: the one speaking dialects akin to the Welsh, and the other those allied to the Gaelic. There were at no remote date three dialects falling under the former of these divisions; the Welsh proper, the Cornish, and the Armoric. Early in the present century an old woman was reported to be living in Cornwall who could speak Cornish; but when she died the Cornish language died with her. The Armoric is spoken in Brittany in the northwest of France. The Gaelic is divided into three dialects—the Gaelic proper, current in the Highlands of Scotland; the Erse, in the wilder parts of Ireland; and the Manx, in the Isle of Man. The Celtic languages are becoming rooted in parts of Canada. In England, in France, and in other places there is much Celtic blood in regions where Armoric has become extinct. With the exception of the Scottish Highlanders, nearly all the Celts are Roman Catholics. In war they are "bravest of the brave." They are fiercer and more dashing in assault than the Teutons; but they are, however, less vigilant in camp and on the march, less stolid under defeat, and their highly strung nervous organisation renders them prone to panics. The Celt is passionate, imaginative, and venturesome, and the note of tender melancholy in his minstrelsy rings through the poetry of every nation that possesses a strain of his blood.

We come next to the *Slavonic* race. No better description of this race has yet been given than that by Milne-Edwards, who writes of them as follows :—"The contour of the head viewed in front approaches nearly to a square; the height surpasses a little the breadth, the summit is sensibly flattened, and the direction of the jaw is horizontal. The length of the nose is less than the distance from the base to the chin; it is almost straight from the depression at its root—that is to say, without decided curvature; but, if appreciable, it is slightly concave, so that the end has a tendency to turn up; the inferior part is rather large, and the extremity rounded. The eyes, rather deep set, are perfectly on the same line; and when they have any particular character, they are smaller than the proportion of the head would seem to indicate. The eyebrows are thin, and very near the eyes, particularly at the internal angle, and from this point are often directed obliquely outwards. The mouth, which is not salient (projecting), has thin lips, and is much nearer to the nose than to the tip of the chin. Another singular characteristic may be added, and which is very general—viz., their small beard, except on the upper lip."

To this third division of the Aryan race belong not merely the Russians and the Poles, but also the genuine Bulgarians, the Servians, the Bosnians, the Montenegrins, the Dalmatians, the Croats, the Vends or Slovaks, the Czechs or Bohemians, the Moravians, the Lettic tribe, the Lithuanians, and others. So large a portion of the Slavonic race is under the Russian Czar, and so slender is the cohesion of at least one of the two empires—Turkey, in which many other Slavonic tribes reside—that there has grown up the doctrine of Panslavism. In πᾶν (pan) may be recognised the neuter of the Greek adjective, or rather collective pronoun, signifying "all." Panslavism, then, at the least, contemplates the gathering together of all the Slavonic tribes into one great racial organisation.

The other Aryan races in Europe live along the shores of the Mediterranean. According to Dr. Latham, they have long heads, high facial angles, dark eyes and complexion, and a bodily frame more slender than bulky. As stated before, if classified according to the languages which they speak, they must be divided, as is done by Professor Max Müller, into the Italic, the Illyrian, and the Hellenic races.

In the case of the first, the test of language is somewhat fallacious, since Latin spread among tribes not closely akin to those who spoke it originally. Six more modern forms of speech sprang from it, and are sometimes called the Romance languages. They are the Portuguese, the Spanish, the French, the Provençal, the Italian, and the Wallachian. Only two of these require explanation. The Provençal language was that of the old troubadours, but it has now degenerated into a mere *patois* spoken in the Grisons of Switzerland, and on the borders of the Tyrol. The Wallachian tongue is current in Roumania, in parts of Hungary, Transylvania, and Bessarabia, and to a certain extent in districts of old Thrace, Macedonia, and even Thessaly. The principality first mentioned constituted the major portion of the province of Dacia, colonised by the Romans as an outpost to defend the empire on that side from the barbarians; and the Latin introduced by those colonists has modified the speech of the people there to this day.

It has already been mentioned that many of the nations who now speak Latinised languages have no close affinity to the old Romans. They are very mixed in blood. Most of the inhabitants of Roumania are probably of Slavonic, and some even of Gothic descent. The Etruscans, though resident in Italy, are not at all akin to the other inhabitants of that peninsula, and are very difficult to classify. The north and middle of France were originally Celtic; its southern portion was inhabited by the Basques or Iberians, who were not Aryans. Spain was partly Iberian and partly Celtic; Portugal was much the same,

The *Illyrian* race is now represented by the Albanians, who speak a language not closely akin to others, but which has at length been declared Indo-European.

The *Hellenic* race comprehends the Greeks, once renowned throughout the world for their mastery over all the arts that made life worth living. Centuries of Turkish oppression did not suffice to subdue their spirit. Turkish barbarism, that broke up the masterpieces of their classic sculptures, in order that they might be made into lime, did not suffice to eradicate their faith in the Hellenic idea. Even an intermixture of savage Turkish blood failed to rob the Greek of his bright intellect, his love of culture, his flashing wit, his craft and enterprise alike in diplomacy and in commerce. The Greek language of to-day is nearer ancient Greek than Italian is to Latin, and of all races that are or have been under Ottoman rule the Greek is the most progressive and hopeful. From close affinities between Latin and Greek, Latham has argued that the Greeks originally came to Hellas from South Italy.

Of the three Aryan races of Northern and Central Europe, the Celts seem to have been the first to come from the primitive settlement in Persia. The

Teutons, perhaps, followed next, and then the Slavonians. The Lithuanian language, one belonging to the Slavonian family, approaches most nearly of all the European tongues to Sanscrit.

There are other than Aryan peoples in the great Continent to which this paper has been devoted, but of these we shall speak subsequently, when treating of the Turanian race.

ASIATIC SECTION.—The leading tribes comprehended under this section of the great Aryan race are the Brahmans and the Iranians or Persians. Both of these have had their early history wonderfully cleared up by investigations into the Vedas, or oldest of the Brahmanic sacred writings, and into the Zendavesta, or Parsee scriptures.

The old Aryan tribe from which sprang the ancestors of the leading European nations, as well as those of the Brahmans and Parsees, seems to have had its place somewhere north of the Hindoo Koosh range of mountains, in the region which used to be called in maps of Asia "Independent Tartary," but which is now more accurately termed Turkestan. When those Aryans who were destined ultimately to people Europe left their primitive abode in Central Asia, the rest of the tribe lingered for some time in the old settlement; and when at length they did move, they journeyed not westward but southward, went through or around, first, the Hindoo Koosh, and next the stupendous Himálaya Mountains; and ended by leading a wandering shepherd life in the Punjáb. At that time their worship was a simple one, being in the main the adoration of the elements in Nature. They found the north of India, as is believed, inhabited by Turanians, against whom, however, they managed to hold their own. The date of their immigration into India was a very remote one, being possibly as far back as 1700 B.C. After many years, a portion of the shepherds becoming tired of the pastoral life, began to cultivate patches of land, and probably became what we should now call wealthier than the rest of the tribe. The shepherds felt no scruple in helping themselves to a share of the farm produce raised and stored up through the industry of their agricultural brethren; and a quarrel which deepened into a feud between the two was the result. The agriculturists ultimately left the Punjáb in disgust, and returned to the region beyond the Hindoo Koosh, where for a long period they resided in Bactria, a province of which the capital in subsequent times was at the place now called Balkh. A religious schism accompanied this political separation. The agriculturists, who had hitherto been of the same faith as the shepherds, considered that the gods they had been accustomed to worship, or some of them at least, instead of protecting them, had helped their plundering co-religionists; and they cast off allegiance to the spiritual authority which had been exercised so unfairly. The shepherds continued to pay them divine honours, and became the Brahmans of India, while the agriculturists who had emigrated to Central Asia were the progenitors of the old Persians. The gulf between the two factions widened with the lapse of years. The Brahmans, influenced seemingly by the Turanians, among whom they had settled, fell into idolatry, while the Iranians in Bactria abstained from this form of superstition; and, finally—about the time perhaps of Moses, 1500 B.C.—there arose in the Bactrian settlement a very remarkable man (Zarathustra Spitama by name, the same whom the Greeks call Zoroaster), who remodelled and fixed the faith of his people, preached the doctrines embodied in the older parts of the Zendavesta, and made the Parsee religion very much what it is to-day. He believed in the unity of God. In accounting for the prevalence of evil in the world, he assumed the existence of two principles —one good, and the other bad, ultimately elevated by his followers into two great supernatural beings in perpetual antagonism. The old elemental worship still remains in the adoration of the sun and fire. Cyrus, Darius Hystaspes, and Xerxes were of the Parsee race and faith. Yet more interesting, some of the most enterprising natives of Bombay are Parsees. Sir Jamsetjee Jeejheebhoy was one, and many may be seen in the streets of London, where they have established mercantile houses. It is the Parsees that Moore makes his heroes in the well-known poem, "Lalla Rookh." The evidence of language shows that the Affghans (who speak the Pushtoo tongue), the Koords, the Ossetians of the Caucasus, and the Armenians too, belong to the Iranian race.

We must now follow the fortunes of the Punjáb shepherds. They became, as already mentioned, the Indian Brahmans. Time was when it was supposed that all the Hindoos belonged to a single family of mankind, and that the Brahmanic one; but this notion has been quite abandoned during recent years. The languages of Southern India, though modified by Sanscrit, the Brahmanic language, are still essentially distinct from it, and are, in fact, Turanian. Even the tongues spoken in Central and Northern India, which were once regarded as offshoots of Sanscrit, are now held to be of a Turanian origin, though changed by a great infusion of Sanscrit words. All that is known of early Indian history goes to confirm the conclusions to which an examination of the languages naturally leads. Though, as before mentioned, the Brahmans entered India at a remote period of antiquity, yet for a long time they never passed beyond the Punjáb, and centuries elapsed before they reached the Vindhya mountains in the middle of India. Either that elevated range, or the Nerbudda river just south of it, for a long time constituted their southern boundary; so much so that Hindostan, which etymologically means "the place of the Hindoos," properly signifies not the whole of India, but only that portion of it which is north of the Nerbudda.

The Indian Brahmans are, as a rule, fairer than the Turanian inhabitants of India, though there are dark individuals amongst them too. Having for 3,000 years been the pre-eminently educated Hindoo caste, intellect has become so nearly universal among them that the Brahman boys are the best scholars in every Indian school. The Brahmanic religion is now totally different from what it was at first, having largely borrowed from the Turanian faith, which it has failed to displace. Buddhism is of Indian origin, though its great seat is China. Thus of the leading religions now in the world, Brahmanism, Zoroastrianism, and Buddhism originated with the Aryans.

THE SYRO-ARABIAN RACE.

As before mentioned, instead of the appellation Syro-Arabian, some use the term Shemitic, or Semitic, in speaking of this family of mankind. Its exact limits have not yet been settled beyond dispute. Using language as our guide, and omitting for the present tongues doubtfully Semitic, the forms of speech now under consideration fall naturally under three divisions—the Northern, or Aramaic; the Middle, or Hebraic; and the Southern, or Arabic.

Much light has been thrown on the first-mentioned of these divisions, the North Semitic one, by the examination of the cuneiform inscriptions found in the territories successively ruled by the old Asiatic empires. Cuneiform means *wedge-shaped*, the first part of the word being derived from the Latin *cuneus*, a wedge. The characters called *cuneiform* are also often described as arrow-headed. Many readers will at once recognise them as those singular lines, thick at one end, covering men, lions, bulls, etc., in the Ninevite sculptures in the British Museum, and the copies of them at the Crystal Palace. It required a great deal of ingenuity and perseverance before the arrow-headed writing was deciphered, and when the feat was, at least to a certain limited extent, accomplished, it was found that the Persian writing on the rock of Behistun, at Persepolis, and other places ruled by the Zoroastrians, was, as might have been anticipated, in a language allied to Zend; that of Nineveh and Babylon, on the contrary, is held to be in the main Semitic. The other ancient dialects belonging to this division of tongues are the Chaldee and the Syriac; the former spoken of old in the eastern, and the latter in the western part of the Aramæan area. The term *Chaldee* is not a good one, for it is supposed that the Chaldees of Scripture were Aryans. The so-called Chaldee and Syriac are believed to be so closely allied, that some deny their separate existence as dialects. The Jews, in a measure, lost their Hebrew, and acquired East Aramæan during their residence in Babylon; and parts of the books of Ezra and Daniel are written in it. Words and phrases belonging to it occur in various parts of our English version of the Bible, as in Gen. xxxi. 47; Mark v. 41; vii. 34; xv. 34. In the first of these passages Jegar-sahadutha is Aramæan, and Galeed is Hebrew. Both signify "the heap of witness;" or, more accurately, the Aramæan phrase means "the heap of witness," and the Hebrew equivalent "the witness-heap." One finding the two so different would naturally suppose that Hebrew and Aramæan had no close affinity, but the inference would be erroneous. The words in the passage in Genesis happen to be exceptionally unlike; the comparison of a multitude of others would conduct to a conclusion just the opposite of that suggested by this single case. The Arabic had long extinguished the Aramæan or Syriac itself, but it still lingers among the Nestorians of the Upper Tigris near Lakes Ooroomiah and Van.

The second division of the Syro-Arabian race is that speaking the Hebraic branch of the Semitic tongues. With the limited space at our command, we can do no more than mention the Jews, in some respects the most interesting of all nations; but, happily, their history is so well known that it is unnecessary to enter on it here. Latham thus describes the physical characteristics which distinguish the Jews from the Arabs, to whom they are closely allied:—"Physical conformation, differing from that of the Arab in (*a*) greater massiveness of frame; (*b*) thicker lips; (*c*) nose more frequently aquiline; (*d*) cranium (skull) of greater capacity."

Samaritan is a mixture of Hebrew and Aramæan. The evidence of language proves the remarkably interesting fact that the Phœnician tongue—the one spoken first in Tyre and Sidon, and subsequently in Carthage, in connection with which it obtained the name of Punic—was almost identical with Hebrew. Farrar sums up the evidence on the subject in his "Families of Speech," as follows:—

"We know that Carthage itself means in Hebrew, 'Newtown;' that Byrsa, its citadel, is the Hebrew *bozra* (a fortress); that *bal* in such names as Hasdrubal and Hannibal is simply *Baal;* that Barca, the family name of Hannibal, is the same as *Barak* (lightning); that *suffetes*, which Livy tells us was the name of the Carthaginian magistrates, is the Hebrew *shophetim*, or 'judges;' that Lilybæum, the name they gave to the western angle of Sicily, means 'towards Libya'—*li* being simply the Hebrew preposition. Finally, not to dwell on other proofs, Plautus wrote a play called *Pænulus* (the Little Carthaginian); and in that play a Punic scene is introduced, which, so far as it has been yet deciphered, is most distinctly Hebraic in its character. St. Augustine, who was himself a Carthaginian, says that Hebrew and Carthaginian differed but little."

The Arabic, or southern division of the Syro-Arabian race, is the last to which we shall turn our attention. The French Baron Larrey thought the Arabs, physically and mentally considered, the most perfect of mankind; maintaining that they had more convolutions in the brain, and a finer organisation of the physical parts ministering to intellect, than other people. This opinion has not been perfectly confirmed. Latham thus describes the physical characteristics of the Arab race:—"Face oval; forehead vaulted; nose straight or aquiline; lips thin, even when thick, not projecting; hair wavy or curled; complexion various shades of brown; limbs spare." The Bedouins constitute but a limited part of the Arab race. A very large section of the Arabs live like other people in towns, of which there are many in the Arabian peninsula itself. The Arabs are formidable in war, alike in the open field and from behind stone walls. It was among them, as is well known, that the Mohammedan faith arose.

The Arabic division of the Semitic tongues is again separated into two—the Northern, or proper Arabic; and the Southern, or Himyaritic. With the last is conjoined at least one, and probably two, of the Abyssinian tongues. The old Gheez, now extinct, was Semitic; so was the language of Tigré. The modern Amharic, the court language of Abyssinia, is more mixed. Apparently the old Himyaritic Arabs must have overflowed into Abyssinia.

It is believed that the Berber or Amazirgh language, that spread here and there through the Barbary States, is also Semitic.

The Coptic language was once ranked as undoubtedly Semitic, but further researches into the subject have thrown considerable doubt on the correctness of this classification. We shall return to the subject of the Abyssinian, the Egyptian, and the Berber tongues in the next lesson.

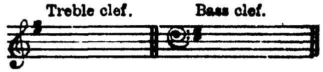
MUSIC.—XII.

[Continued from p. 261.]

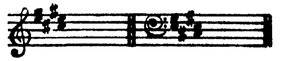
ORDER OF PLACING SHARPS OR FLATS IN A SIGNATURE.

THERE is a conventional method of placing the sharps or flats of a signature that should be well understood. *Rule.—No sharp or flat of a signature is placed upon a ledger line.* The signature governs all octaves. Thus, although the ♯ necessary to the scale of G is placed on the highest F, it must be understood to govern all the F's that occur.

Sharp Signatures.—The scale of G requires one sharp. This is placed upon the highest F of each clef.

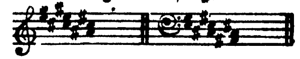


Further sharps are added on a regular plan, *with one deviation.* Each new sharp required is placed alternately a fourth (*i.e.*, four degrees) *below* and a fifth (*i.e.*, five degrees) *above* the previous sharp.



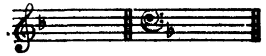
The rule, however, is broken at the *fifth* sharp, because the fifth degree above the last sharp would, on the treble clef, be a ledger line, namely, high A. So the A a fourth below is sharpened, and the order is imitated on the bass clef for the sake of uniformity, although not otherwise called for. The order of rise and fall is then resumed.

Signature of C♯.



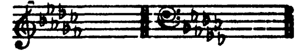
The signature of the key of C♯ *therefore includes the signatures of all the other sharp keys.*

Flat Signatures.—The scale of F requires one flat. This is placed upon the B line of each clef.



Further flats are added on a regular plan, *without deviation.* Each new flat required is placed alternately a fourth *above* and a fifth *below* (compare the plan for sharp signatures) the previous flat.

Signature of C♭.



The signature of the key of C♭ *therefore includes the signatures of all the other flat keys.*

READING SIGNATURES.

Ultimately the key-signatures should be so well known that the quickest glance is sufficient to determine a key. The practice necessary to attain this familiarity will vary with the student's determination and retentiveness. While he is learning the signatures by heart he will be able to find where *doh* is (which is what he most wants to know) by recollecting that the LAST FLAT TO THE RIGHT (or the one flat, if there is only one) OF A FLAT SIGNATURE IS ON *FAH* of the key shown, and the LAST SHARP TO THE RIGHT (or the one sharp, if there is only one) IS ON *TE* OF THE KEY SHOWN.

USE OF KEY-SIGNATURES.

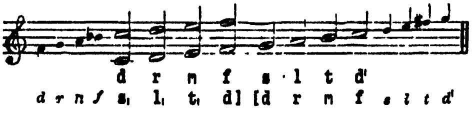
Theoretically, the various key-signatures serve to show the relation of a key to the key of C, and they of course determine the pitch of the key-tone. But practically the singer is not required to keep in mind the key of C while he is singing in any other key. The signatures, therefore, simply help him to discover what tone of the scale he is to sing. That is, they do this at the present stage. In very difficult music the signatures, as often employed by modern musicians, are a source of great embarrassment to singers. Let the student keep in mind the fact that the signatures are mainly ways of expressing the tune **d r m f s l t d^1** from various pitches, and that he is no more to trouble himself to sing "sharp" where the sharps of the key of B fall than he has to sing "flat" where the flats of the key of A♭ fall. He has to recognise and sing the scale-note expressed.

TETRACHORDS AND THE RELATIONS OF KEYS.

Four successive tones form a TETRACHORD.

			B **t**			
F **f**	G **s**	A **l**		C^1 **d^1**	D^1 **r^1**	E^1 **m^1**
E **m**			A **l**	B **t**		
	F **f**	G **s**			C^1 **d^1**	D^1 **r^1**
D **r**	E **m**		G **s**	A **l**	B **t**	
		F **f**				C^1 **d^1**
C **d**	D **r**	E **m**	F **f**	G **s**	A **l**	B **t**

The above compares the steps of all the tetrachords in the natural scale. It will be seen that the tetrachords on C (or *doh*) and G (or *soh*) are exactly alike. The top four notes of the scale, therefore, make the same tonal succession or tune as the bottom four notes.



Each half of the natural scale, then, provides the *soh*, *lah*, *te*, *doh*, or the *doh*, *ray*, *me*. *fah*, of another scale. If the tetrachord *soh*, *lah*, *te*, *doh*, is regarded as *doh*, *ray*, *me*, *fah*, it will be found that one note (F) must be sharpened to provide the new leading note or *te*; and if the tetrachord *doh*, *ray*, *me*, *fah*, of the natural scale is regarded as *soh*$_1$, *lah*$_1$, *te*$_1$, *doh*, it will be found that one note (B) must be flattened to provide the new subdominant or *fah*. Thus, in one case, a former *fah* is sharpened to provide a *te*, and in the other a former *te* is flattened to provide a *fah*. Keys thus connected by a tetrachord they have in common are said to be RELATED KEYS. The contiguous columns in the diagram of scales on page 260 show these relations quite clearly. Each column to the right starts upon the dominant or *soh* of the preceding key, and regards it as a tonic or *doh*, and each column to the left starts on the subdominant or *fah* of the preceding key, and regards it as a tonic or *doh*. Consequently, reckoning from the centre to the right, each new key requires a sharp on the old *fah* to provide the new *te*, and reckoning from the centre to the left, each new key requires a flat on the old *te* to provide the new *fah*. Further, reckoning from the extreme left (key C♭), and working to the right, each new key raises a *fah* to provide a *te* (by *taking away* a flat), and reckoning from the extreme right (key C♯) to the left, each new key depresses a *te* to provide a *fah* (by *taking away* a sharp). Do not be discouraged by this apparent complication. As you familiarise yourself with the details you will be attracted by the beautiful symmetry they exhibit, and as your experience of music grows wider and more analytic you will see what pregnant truths are wrapped up in what may now appear to be dry and pedantic explanations.

EXERCISES (TONIC SOL-FA NOTATION).

Ex. 106.—How many tones, or tones and semitones, separate the following pairs of notes: (*a*) *doh* to *fah*; (*b*) *ray* to *fah*; (*c*) *fah* to *te*; (*d*) *me* to *doh*^{1}; (*e*) *soh* to *doh*^{1}?

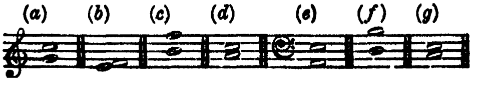
Ex. 107.—Why is the scale from *doh* to *doh*^{1} called a major scale, and the scale from *lah* to *lah* a minor scale?

Ex. 108.—State the scale relations (as tonic, dominant, etc.) of the following: (*a*) *ray*; (*b*) *te*; (*c*) *me*; (*d*) *lah*; (*e*) *doh*; (*f*) *soh*; (*g*) *fah*.

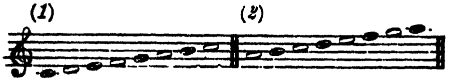
Ex. 109.—What other tetrachord in the scale is the same shape (*a*) as that on *te*; (*b*) as that on *ray*; (*c*) as that on *doh*?

(STAFF NOTATION.)

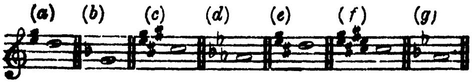
Ex. 106.—How many tones, or tones and semitones, separate the following pairs of notes?



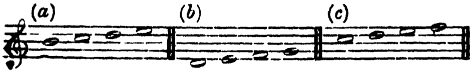
Ex. 107.—Why is the scale (1) called a major scale, and the scale (2) below called a minor scale?



Ex. 108.—State the scale relations (as tonic, dominant, etc.) of the following notes:—



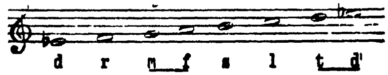
Ex. 109.—What other tetrachord in the scale of C is the same shape as that shown at (*a*); as that shown at (*b*); as that shown at (*c*)?

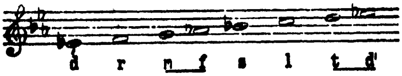


The following exercises in writing scales and signatures should be written on the plan now to be described.

Question.—Write the scale of E♭, placing the necessary flats before the notes to be flattened as well as in the signature.

Answer.—First write a scale from E to its octave, leaving space for flats, and at once flatten the E. Then write the sol-fa names, drawing a line under **m f** and **t d**^{1}, to show the places of the semitones. Then calculate, step by step, thus: **d** to **r**, a full tone = E♭ to F: **r** to **m**, a full tone = F to G; **m** to **f**, a semitone, is not equal to G to A, therefore A must be flattened; **f** to **s**, a full tone, does not equal A♭ to B (a tone and a half), B must therefore be flattened; **s** to **l**, a full tone = B♭ to C; **l** to **t**, a full tone = C to D; **t** to **d**^{1}, a semitone = D to E♭. Then place the flats in the signature in the order described on p. 321.

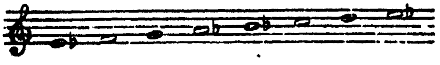




In writing scales in columns, as on page 260, or on the staff, attend to the following instructions:—

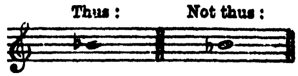
1. Sharps and flats are *written before* notes and *said after* notes. Thus, *say* F sharp, but *write* sharp F.

This is wrong,

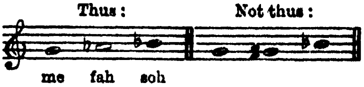


because the flats are placed after the notes they qualify.

2. See that your sharp or flat is exactly on its proper line or space.



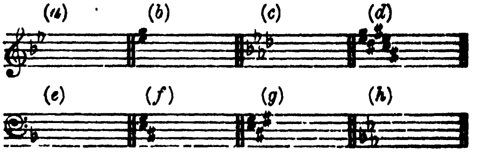
3. No alphabetical pitch name must be missed, and no one must occur twice in succession. Do not miss a line or a space, and do not use a line or a space twice in succession.



Ex. 110.—Write the scale and signature (*a*) of D, as shown above; (*b*) of A; (*c*) of E; (*d*) of B.

Ex. 111.—Ditto (*a*) of F; (*b*) of B♭; (*c*) of A♭; (*d*) of D♭.

Ex. 112.—What keys are shown by the following signatures?



NEW DIVISIONS OF THE PULSE.

Half-pulse Rests.

Half-pulse rests are sometimes difficult to observe. When they occur on the *second* half of the pulse they are comparatively easy, because the performer has merely to strike a short note as the stroke or shock of the pulse is due. But when the rest is on the *first* half, where the swing of the pulse invites and almost impels action, the restraint of silence often embarrasses the inexperienced performer. Time names for rests are useful at first, because they draw attention to the fact that there is a rest to observe.

(TONIC SOL-FA NOTATION.)

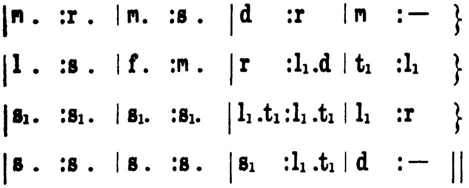
| **1** . :**1** .
TAA *SAI* TAA *SAI*

| .**1** :**1**
SAA TAI TAA

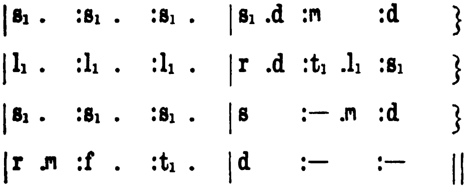
Half-pulse rests are shown by the space before or after the dividing dot being left empty. The time name substitutes "s" for the consonant that would be used for the struck half-pulse.

The following exercises contrast whole-pulse notes and half-pulse notes followed by half-pulse rests. Take care to fill out the whole-pulse notes. Sing the half-pulse notes sharply at the moment the shock of the pulse is due. Sing on a monotone once to the time names, including the names for rests, then again omitting the names for rests, then again on a monotone to *laa*, and afterwards in tune and time.

Ex. 110.—*Doh* is G.

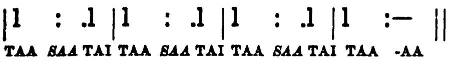


Ex. 111.—*Doh* is A.



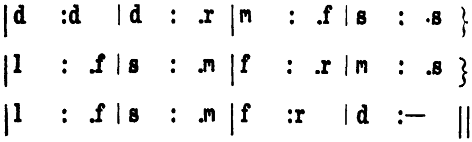
The following exercises introduce rests on the *first* half of the pulse. One good way of practising is to say the full time names once or twice, and then only to *think* the *saa.* Pupils who can beat time (*i.e.*, pulses) whilst they sing are greatly assisted at this stage. The movement in beating satisfies the desire that *something* should occur at the beginning of a pulse.

Ex. 112.



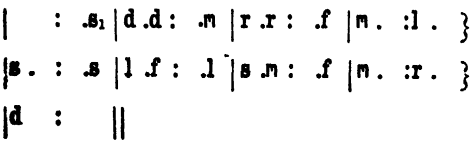
The above should be practised repeatedly until it can be easily sung on a monotone to *laa.*

Ex. 113.—*Doh* is F.



Both forms.

Ex. 114.—*Doh* is G.



DRAWING.—XII.

[*Continued from p.* 265.]

REFLECTIONS IN WATER.

We now take up another portion of our subject relating to landscape—the principles of the reflection of objects in water, as by reflection only can water be represented.

It has been frequently said that a landscape is incomplete without water; it is certainly an element which contributes much additional beauty and effect to any scene, be it ever so simple; yet we cannot go so far as to say that it must necessarily be introduced in all cases. Independently of itself, there are associations connected with water that cannot be passed over without notice, and which bear an important part in the whole composition whenever it forms a portion of the picture, such as shipping, barges, boats, fishermen, and picturesque bridges. Why is it that, in our choice of a walk, we generally prefer a stroll near some stream? We attribute it to the variety of scenery afforded by the winding river, and the numberless points of interest that catch the eye as we ramble along its banks. The life and motion connected with water have no limit; and besides, we cannot forget, when it is clear and calm, its capability of reflecting every object near it in full perfection, and increasing our admiration by the fidelity with which it reverses form and reflects colour, light, and shade, thus making a double picture. There are several phenomena resulting from the appearances of reflections upon the surface of water which undoubtedly require more attention than is generally devoted to such subjects by many who aim at representing them. A course of study is necessary which some would suppose to be beyond the limits pursued by artists generally, but which we contend is indispensable; for everyone who undertakes or hopes to paint Nature as she is must go deeply into her mysteries and endeavour as far as possible to understand them, and not abide by a mere superficial following of outward appearances. Why is it that the sculptor and the historical painter seek the advantages to be gained in the dissecting-room? Because they feel that a knowledge of anatomy is of the utmost importance to them when engaged upon the human form. Similarly the landscape painter wisely looks about for aid when difficulties arise, which have their remedy often beyond the limits of his own legitimate art; and he will meet with an abundant source of difficulty with regard to reflections. There are incidents so puzzling connected with these, that unless he possesses a little geometrical knowledge he cannot avoid falling into endless mistakes. We must again have recourse to geometrical perspective, which will not only assist us in our explanations, but will set at rest many doubts which might arise in the minds of our pupils with regard to *facts* that seem to be *impossibilities*, unless we employed this conclusive help in rendering them intelligible. Sir Joshua Reynolds said, "The rules of art are not fetters to genius; they are fetters only to men of no genius."

It is not the rule that because we can see the *objects* we must consequently see the *reflections;* and, on the other hand, it is very common to *see the reflection* of an object, or of light, when the eye does *not see the object itself*, something *intervening between the eye and the object, but not between the eye and the reflection.* The leading principle, upon which is founded all other data connected with our subject, is that the *reflections of all objects and their parts are always perpendicularly beneath the objects and the parts themselves respectively.* Fig. 112, a simple subject of posts, etc., will explain this. The top of the post *a* is perpendicularly over the reflection *b*, and so with the rest; but it must be borne in mind that the *proportion to be drawn* of the reflection of an object is regulated by or according to the *position* of the object, and also with regard to the point from which we view it. If we view the posts (Fig. 112) as they are drawn, perpendicularly and parallel with the picture plane—that is, the upper parts neither advancing towards the eye nor receding from it, but exactly over the position of the lower parts—then the reflections will be the same in length, with the slight exception resulting from the perspective of distance. We will endeavour to make this clear by the help of a few problems. In order fully to understand these problems we recommend the pupil to work them out, and as the principles of construction are the same throughout, we advise him to repeat them with a few of the conditions varied—for instance, greater or less inclinations of the slopes, and greater or less elevations of those objects which are most in advance. Our first subject will be to draw the reflection of a wall (Fig. 113). Let A be the end section of a wall situated on the margin of a river. It is required to show its reflection, B, below the water's edge, C D; S^1 being the *position of the eye* on the horizontal line. Draw a line, S^1 S^2, perpendicularly as much below the base C D as it is above it, making S^2 E equal to S^1 E. From the upper part of the wall F draw a line to S^2, and where this line cuts the base C D in H will give the point through which a line is to be drawn from S^1 to meet a perpendicular line from F, which will give the depth of the reflection required. Now in order to apply the above rule in showing the face of the wall and its reflection we must proceed as follows:—In Fig. 113 draw at pleasure the line *a c d b*, and repeat this line, with its respective divisions, in Fig. 114; through the several points *a c d b* draw horizontal lines at right angles with *a b;* make A B equal to the length of the given wall, and draw the rectangle A G H B; A B F E will represent the wall, E F H G the reflection. The pupil must be reminded that the line *a c d b* in Fig. 113 is the picture plane or medium through which we see the wall, and upon which it is supposed to be traced (*see* Vol. I., p. 72, Def. 3, "Station Point"). We have previously observed that in consequence of the position of the eye being above the reflection, and on a level with some portion of the object, it will repeatedly occur that the *reflections* of *many parts* of the solid cannot be seen, although *the parts themselves are in sight*, and form, perhaps, the most important portions of the object. Let us illustrate this by Fig. 115, which is a mass of masonry, having two slopes, A and B. Having drawn the profile or section G, proceed as in the last case, being careful to draw lines, or visual rays, from every angle to S^1, and also to S^2. Where these rays cut each other respectively in *w*, *t*, *g*, lines from S^1 will determine the lengths of the reflection. We must apply this to a front view, as in the former case. Draw the perpendicular line E E^1 (the picture plane), and mark the points where the visual rays cut the picture plane in *a*, *b*, *c*, etc. Repeat this line in Fig. 116, and copy from Fig. 115 the distances of the divisions upon it, and proceed with the horizontal lines from these distances as in the last problem. Upon the line marked *g*, which represents the water's edge, make F G equal to the given length of the wall; *d* being the horizontal line, and the observer being supposed to stand opposite the centre of the wall, the point of sight will be at P S. Now the lines F P S and G P S are horizontal lines in perspective—that is, the perspective of the base *g* H (Fig. 115): therefore, where the visual rays from the points in the base cut the picture plane in *f* (three lines close together) will give the points, *k*, *l*, *m*, whence the perpendiculars of the wall must be drawn, the lower slope F *n* must be drawn between the lines *e*, *g* (*see* Fig. 115), and the perpendicular *k o;* the same with the upper slope. The reason why neither of these slopes are seen in the reflection is because the point P coincides with *g* (Fig. 115) on the picture plane: therefore the same line, F G, represents both extremities of the slope. If the slope B had had a greater elevation—that is, had it been at a greater angle—then the upper extremity would have admitted a line to S^2, and consequently would have cut the picture

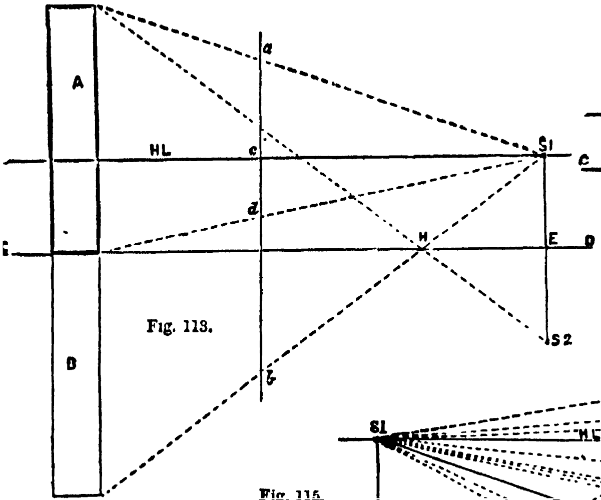


Fig. 113.

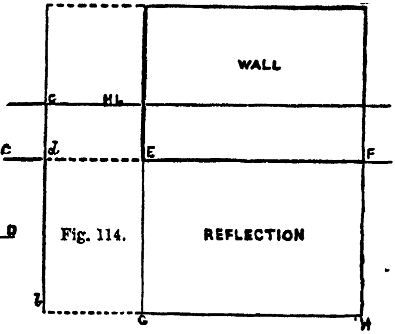


Fig. 114.

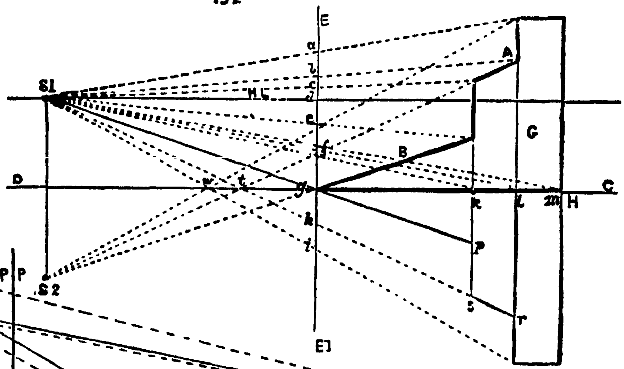


Fig. 115.

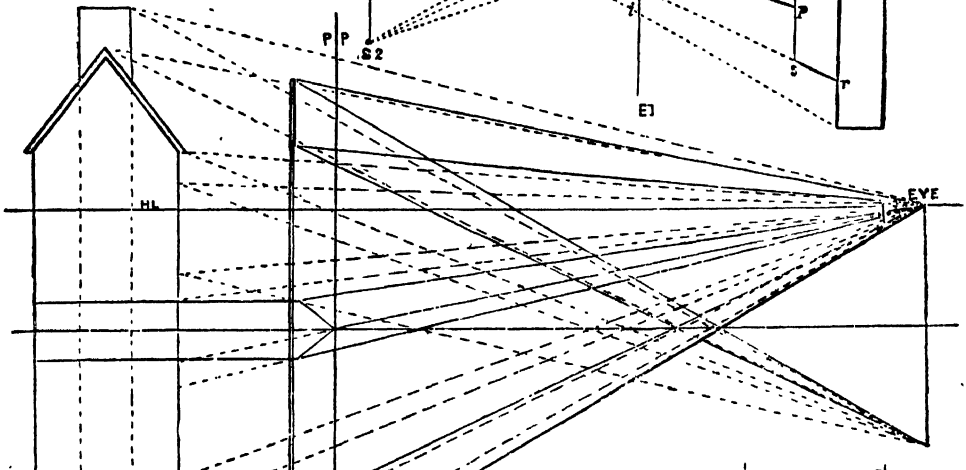


Fig 117.

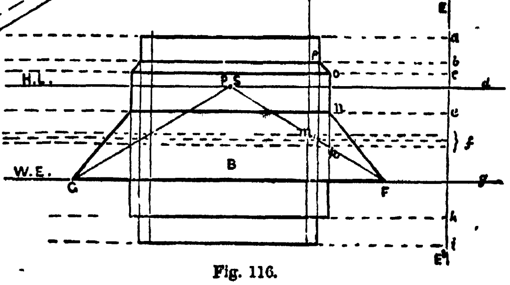


Fig. 116.

plane E E^1 at a higher point than *g;* and that point of intersection would have been shown *below g* in the reflection. And also, for reasons given above, we see *parts reflected* which are not visible in the objects themselves. Figs. 117 and 118 will satisfy the mind upon this point. The subject is a cottage on a bank with a large notice-board in front of it. The profile view (Fig. 117) will explain the distance of the board from the cottage, which will account for the great difference between the projection A and the reflection B in Fig. 118. If the pupil will work out this problem also (of which, being constructed by the same rules as the former, we give no detailed explanation, but prefer leaving it as it is, for an exercise), he will more readily understand it, and the method of construction also; remembering that the visual rays drawn from every important point of *the whole* passing through P P (the picture plane) determine the points to be transferred to the corresponding plane on the left in Fig. 118. We remark that the top of the notice-board is on a level with the top of the roof in the projection A, whilst it is clear of the roof in the reflection B. Also compare the chimney with respect to its apparent position with the board, and note that in the reflection B the sills of the windows are on a line with the base of the post, and the threshold of the door cannot be seen because it is hidden by the bank. There are other differences which the pupil will be able to discover for himself. The same may be satisfactorily proved with regard to clouds. It is common, also, in their cases to see brilliant reflections of light clouds on the water, when to the eye there is nothing to account for them. These reflections are invariably caused by light clouds which are hidden from view behind other clouds, the reflections affording us the only evidence of their existence. Why is this? And where is the root of the mistake that is so frequently made, that, without exception, whatever we paint above the water must be necessarily repeated by its reflection? It is simply this, that many treat the whole view, sky and all included, as *one single plane*, never thinking there are parts more remote than others, and consequently many are reflected which are shut out from the eye by intervening objects.

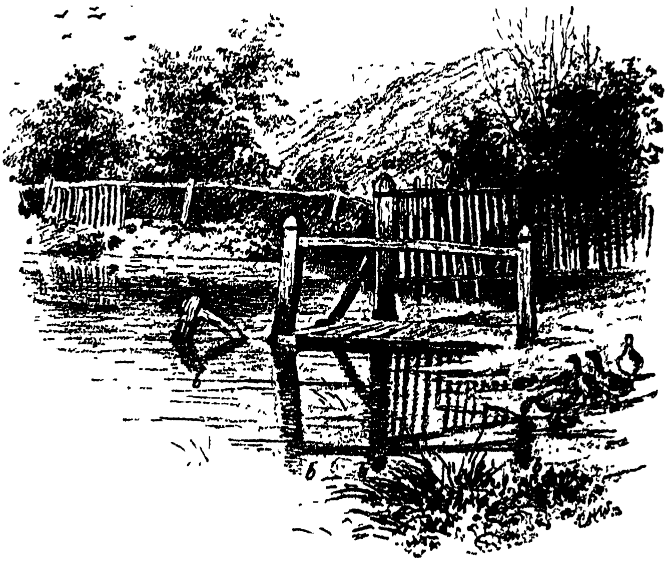


Fig. 112.

Water not only receives reflections, but, *conditionally*, is capable of receiving shadows. If the water is perfectly clear, no shadows occur, and the reflections are more or less vivid in proportion as the water is more or less impregnated with colouring matter, say clay, or as rivers generally appear after heavy rains. Then the strength of the reflections and shadows alternate in proportion to the clearness or opacity of the water. When it is very thick and muddy the shadows of objects are cast as forcibly upon the surface as they are on a road; and as it becomes clearer the reflections become more brilliant and the shadows weaker: the *earthy* *particles* mingled with the water receive the shadow, *not the water* itself. In perfectly clear water the light passes through the water itself, as through a piece of glass, lighting up the bed of the river, so that we are able to distinguish readily the stones, weeds, fish, and whatever else may be at the bottom; then the shadow which falls upon the water sinks as it were, and is seen at the bottom only.

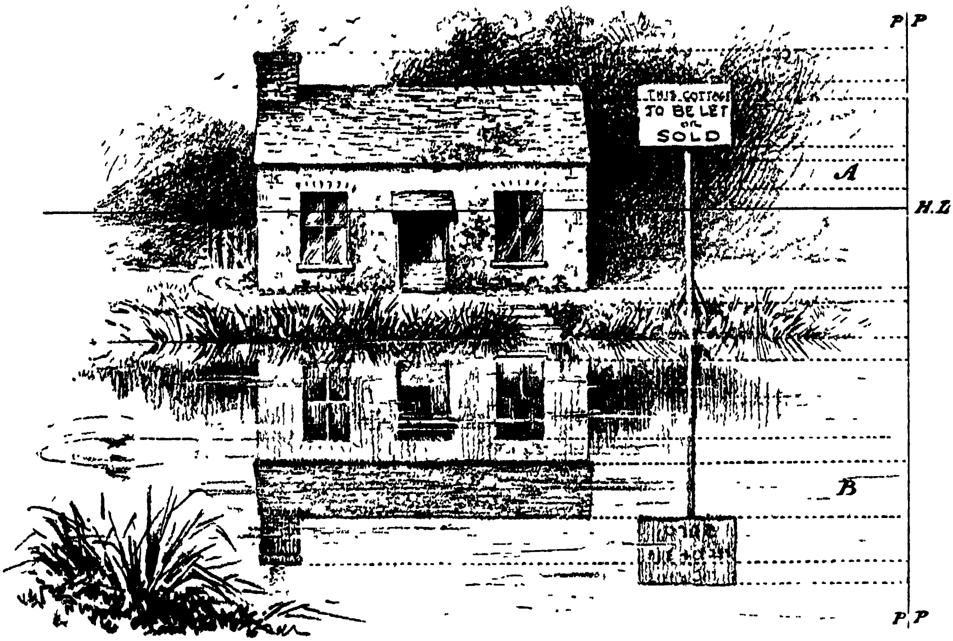


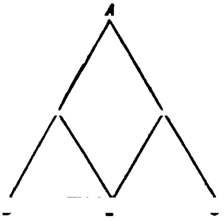
Fig 118.

GEOMETRY.—XII.

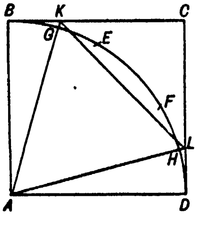
[*Continued from p.* 270.]

INSCRIPTION AND CIRCUMSCRIPTION (*continued*)

Problem 155. — *Within a given equilateral triangle to inscribe another equilateral triangle.* Let ABC be the given equilateral triangle. Bisect the three sides in D, E, and F, and join these points, two and two, forming the inscribed equilateral triangle required.

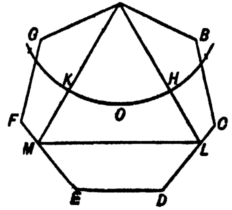


Problem 156.—*In a given square to inscribe an equilateral triangle.* Let ABCD be the given square. About A as centre, with the radius AB or AD, describe the quadrantal arc from B to D. Trisect this arc in E and F, by cutting off BF and DE with the same radius. Bisect the arc BE in G, and the arc FD in H. The straight lines AK and AL, drawn from A through G and H respectively, and meeting the sides of the square in K and L, form two sides of the required triangle, and KL the

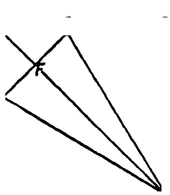


The first object of the solution is to make an angle KAL equal to two-thirds of a right angle, which is the magnitude of an angle in an equilateral triangle.

Problem 157.—*Within a given regular polygon to place an equilateral triangle, having one of its angles at an angular point of the polygon.* Let ABC DEFG be the given regular polygon, and let A be the angular point at which one of the three angles of the required triangle is to be situated. Find the

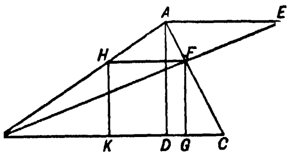


centre O of the regular polygon (Problem 147). About A as centre with any radius—say the radius A O—describe a circular arc, and from O, with the same radius, cut off portions of this arc, each of which will be one-sixth of the circumference of the complete circle. Bisect each portion in H or K, and draw straight lines from A through H and K, meeting sides of the given polygon in L and M. A M L is the equilateral triangle required.



PROBLEM 158.—*In a given square to inscribe an isosceles triangle, having its base equal in length to a given straight line not greater than the diagonal of the square.* Let A B C D be the given square, and E the given straight line. Draw the diagonal A C of the square, and cut off from it A F equal to half E. Through F draw G H at right angles to A C, and meeting the sides A B and A D of the square in G and H. Join G C and H C, completing the isosceles triangle required.

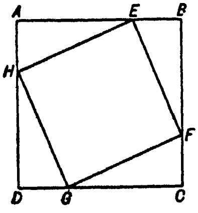
PROBLEM 159.—*Within a given triangle to inscribe a square.* Let A B C be the given triangle.



From any one of the three angles, A, draw a perpendicular, A D, to the opposite side, B C. From A draw a straight line A E parallel to B C, and equal to A D. Join B E, cutting the side A C in F. From F draw F G parallel to A D and F H parallel to C B, meeting the sides of the triangle in G and H. Draw H K also parallel to A D, completing the square H F G K, which is the square required.

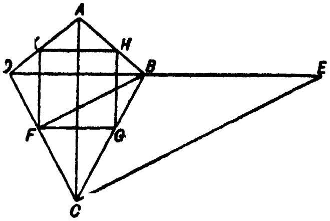
H F bears to A E the same ratio that H K bears to A D, viz., the ratio of B H to B A; and since A E was made equal to A D, H F and H K are also equal.

PROBLEM 160.—*Within a given square to inscribe a square having one of its corners at a given point in the former square.*

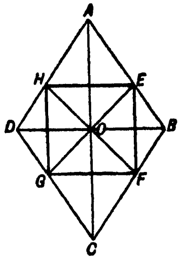


Let A B C D be the given square, and E a given point in A B, one of its sides. From B C cut off B F equal to A E; from C D, C G equal to A E; and from D A, D H equal to A E. Join E F, F G, G H, and H E, forming the inscribed square required.

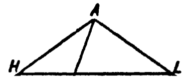
PROBLEM 161. — *To inscribe a square in a trapezium which is contained by two pairs of adjacent and equal sides.* Let A B C D be the given trapezium, having one pair of adjacent sides, A D and A B, equal, and also another pair, C B and C D, equal. Draw the diagonals A C and D B. Produce one diagonal, D B, and from the produced part cut off B E equal to the other diagonal A C. Join E C, and from the point B draw B F parallel to E C, and therefore dividing D C at F, so that D F is to F C in the ratio of D B to B E—*i.e.*, of one diagonal to the other. Draw F G parallel to D B, meeting B C in G, and F K parallel to C A, meeting D A in K. Parallels from G and K to C A and D B respectively will be found to meet at a point H in the side A B, and to complete the square required.



PROBLEM 162.—*In a given rhombus to inscribe a square.* Let A B C D be the given rhombus. Draw the diagonals, which intersect in the central point O of the figure. Bisect the four right angles thus formed at O by the straight lines through O meeting the successive sides of the rhombus in E, F, G, and H. Straight lines drawn between these points form the square required.

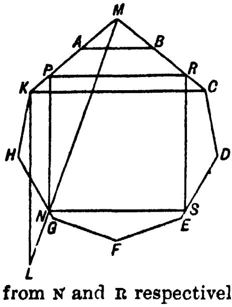


PROBLEM 163.—*To describe a square within a given regular pentagon, having one of its sides parallel to a side of the pentagon.* Let A B C D E be the given regular pentagon. Join any angle, E, to the next but one, B. At E in E B draw a straight line at right angles to E B, and from it cut off E F equal to E B. Join A F, cutting the side E D of the polygon in G. Draw G H parallel to F E, meeting the side E A in H, and G K parallel to E B, meeting the side B C in K. Parallels from H and K to G K and G H respectively will meet at a point L in the side A B, and complete the square G H L K required.

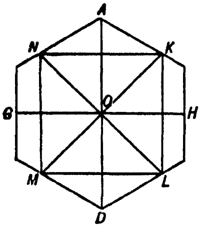


A square may be described within a regular hexagon or a regular heptagon by a similar process, and within a regular octagon by simply joining alternate angular points. A slightly modified process is necessary for polygons having more than eight sides.

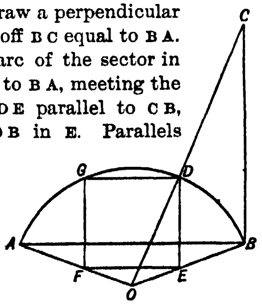
Problem 164. — *To describe a square within a regular nonagon, having one of its sides parallel to a side of the nonagon.* Let ABCDEFGHK be the regular nonagon. The fourth part of 9 sides is somewhat more than two. Instead of first drawing a straight line subtending two sides, as above, it is necessary to draw a straight line KC subtending three sides. Then at K in KC draw a perpendicular to KC, and from it cut off KL equal to KC, as before. Produce KA and CB to meet in M, and join ML, cutting the side HG in N. Draw NP parallel to LK, meeting KA in P; and PR parallel to KC, meeting BC in R. Parallels to PR and PN, drawn from N and R respectively, will meet in a point S on DE, completing the square required.



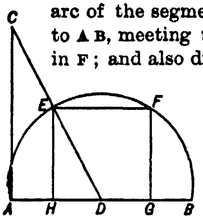
Problem 165.—*To describe a square within a regular polygon of an even number of sides.* Let the given regular polygon having an even number of sides in this example have six, as in the figure. Draw a central diagonal, AD, and draw GH at right angles to it at its middle point O. Bisect the four right angles thus formed at O, and let the two bisectors meet the sides of the polygon in K, L, M, and N. Join each of these points to the next, forming the square inscribed in the polygon as required by the problem.



Problem 166.—*To inscribe a square in a given sector of a circle.* Let OAGDB be the given sector. At the point B in AB draw a perpendicular to AB, and from it cut off BC equal to BA. Join OC, cutting the arc of the sector in D. Draw DG parallel to BA, meeting the arc again in G, and DE parallel to CB, meeting the radius OB in E. Parallels drawn from E and G to DG and DE respectively will meet in F, a point on the other radius, OA, and complete the square DEFG required. DE and EF are equal because they bear the same ratio to the equal lines BC and AB, viz., the ratio of OE to OB.



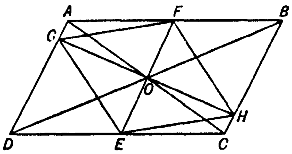
Problem 167.—*To inscribe a square in a given segment of a circle.* Let AEFB be the given segment, standing on the chord AB. At A in AB erect a perpendicular, and from it cut off AC equal to AB. Bisect AB in D, and join CD, cutting the arc of the segment in E. Draw EF parallel to AB, meeting the arc of the segment again in F; and also draw EH parallel to CA, meeting the chord AB in H. A parallel to EH from F, meeting AB in G, completes the square EFGH, which is the square required.



The problem under certain conditions becomes an impossible one—the given segment must not exceed three-fourths of a complete circle.

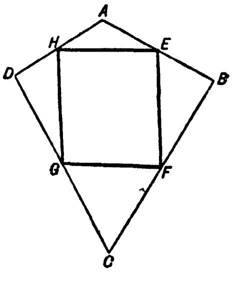
In the triangle DEH, HE is double HD, because in the similar triangle DCA, AC was made double AD. Hence HE is equal to HG.

Problem 168. — *In a given parallelogram to inscribe a rhombus having one of its corners at a given point in one of the sides of the parallelogram.* Let ABCD be the given parallelogram and E the given point. Draw the diagonals of the parallelogram intersecting in O. Join EO, and produce the line so drawn to meet the opposite side in F. Through O draw GH at right angles to EF, and terminated in two opposite sides of the parallelogram. Join FH, HE, EG, and GF, forming the rhombus required.

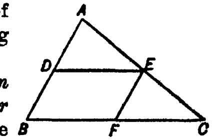


All straight lines drawn through O and terminated by opposite sides of the parallelogram are bisected at that point.

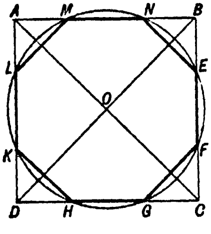
Problem 169.—*In a given trapezium to inscribe a parallelogram.* Let ABCD be the given trapezium. Bisect the sides in the points E, F, G, and H. Join each point to the next. HG and EF are parallel to and half AC, and HE and GF parallel to and half DB.



If in any triangle ABC (second fig.) a straight line DE be drawn from the middle of AB to the middle of AC, it is parallel to BC, and equal to one-half of it, as may be seen by drawing EF parallel to DB.

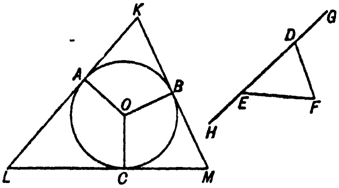


Problem 170.—*In a given square to inscribe a regular octagon.* Let ABCD be the given square. Draw the diagonals AC and BD, intersecting in O. About C as centre, with radius equal to half a diagonal, cut off C E from C B. About O as centre, with radius O E, describe a circle, cutting the sides again in F, G, H, K, L, M, and N. Join F G, H K, L M, and N E, which with the intercepted portions of the sides of the given square form the regular octagon required.



A rectilineal figure is said to be described about another rectilineal figure when the sides of the former pass through the angular points of the latter. A rectilineal figure is described about a circle when each side touches the circumference; and a circle is described about a rectilineal figure when the circumference of the circle passes through all the angular points of the rectilineal figure.

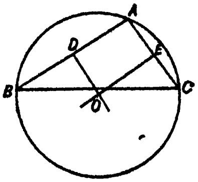
PROBLEM 171.—*About a given circle to describe a triangle equiangular to a given triangle.* Let A B C be the given circle, and D E F the given triangle. Produce E D to any point G, forming the angle F D G supplementary to the angle F D E. Also produce D E to H, forming the angle F E H supplementary to the angle F E D. Take any radius O A of the circle, and at O, on the one side of O A, make an angle A O B equal to the angle F D G; and at O, on the other side of O A, make an angle A O C equal to the angle F E H. Tangents drawn to the circle at the points A, B, and C form the triangle K L M, circumscribed as required.



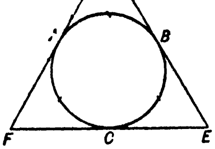
The four angles of the quadrilateral K A O B are together equal to four right angles. But of these the angles at A and B are two right angles, leaving the other two angles at K and O together equal to two right angles—*i.e.*, equal to the two adjacent angles at D. As A O B, one of the former pair, has been made equal to F D G, one of the latter pair, it follows that the angle L K M is equal to the angle E D F. Similarly the angle K L M equals the angle D E F. As the angle K M L, the third angle of the one triangle, must be left equal to D F E, the third angle of the other, the triangles are equiangular.

PROBLEM 172.—*To circumscribe a circle about a given triangle.* Let A B C be the given triangle. Bisect any two of the three sides—say A B and A C—in D and E, and at these points draw straight lines at right angles to A B and A C. Let O be the point of intersection of these perpendiculars. The circle about the centre O, and having its radius equal to O A, passes through the points B and C, and is therefore the circumscribed circle required.

Any point in the perpendicular bisector O D of the line A B is equally distant from the points A and B, and, similarly, any point in the perpendicular bisector O E of the line A C is equally distant from A and C. Consequently, O, which is a point on both bisectors, is equally distant from all three angles of the triangle.

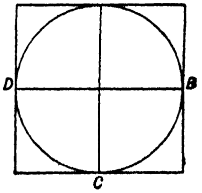


PROBLEM 173.—*About a given circle to describe an equilateral triangle.* Let A B C be the given circle. Adjust the compasses to a distance equal to the radius, and cut the circumference into six equal parts, A, B, and C being three alternate points of the six so obtained. At A, B, and C draw tangents to the circle, forming the equilateral triangle required.

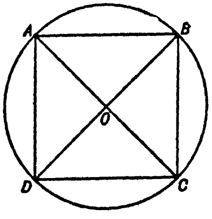


The regular hexagon about the circle is obtained by drawing tangents at all six points, and the regular dodecagon by bisecting all the six arcs, and obtaining twelve points at which tangents are drawn.

PROBLEM 174.—*About a given circle to describe a square.* Let A B C D be the given circle. Find the extremities A, B, C, and D of two diameters at right angles to each other. Through each of these points draw a straight line parallel to the diameter which does not pass through that point. The four tangents so drawn intersect and form the square required.

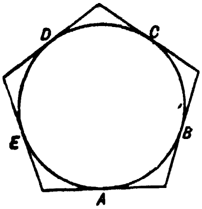


PROBLEM 175.—*About a given square to circumscribe a circle.* Let A B C D be the given square. Instead of drawing perpendiculars at the middle points of two adjacent sides, the centre O of the required circle may be obtained more readily by drawing the diagonals A C and B D, intersecting in O. This is the same point as the intersection of the perpendiculars at the middle points of the sides.

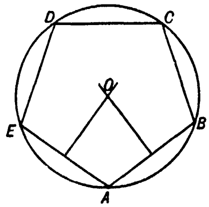


PROBLEM 176.—*About a given circle to describe a regular rectilineal figure of any number of sides.* Let A B C D be the given circle, and let it be

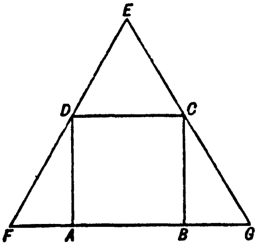
required to describe a regular polygon about it—in this case, a regular pentagon. Find the points A, B, C, D, and E of an inscribed pentagon, and through each of these points draw a tangent to the circle. The five tangents so drawn intersect and form the pentagon required. Any regular polygon may be dealt with in a similar manner.



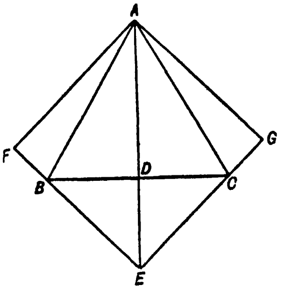
PROBLEM 177.—*About a given regular rectilineal figure to describe a circle.* Let A B C D E be the given plane rectilineal figure—in this case a pentagon. Bisect any two adjacent sides—say A B and A E—by perpendiculars meeting in the point O. Then about the centre O, with the radius O A, a circle may be described passing through B, C, D, and E. The first of the perpendiculars is a line of points equidistant from A and B, and the second a line of points equidistant from A and E. O, their point of intersection, and no other point, is therefore equidistant from A, B, and E, and will be found to be the centre of the regular figure and, consequently, of the circle required.



PROBLEM 178.—*About a given square to describe an equilateral triangle.* Let A B C D be the given square. On C D describe the equilateral triangle E D C. Produce its sides E D and E C to meet the produced side A B of the square in F and G. E F G is the equilateral triangle required.



PROBLEM 179.—*About a given equilateral triangle to describe a square.* Let A B C be the given equilateral triangle. Draw A D bisecting at right angles the side B C, and produce it, so that the produced portion may be equal to D B or D C. Join E B and E C, and produce them to meet in F and G, straight lines from A inclined at half a right angle to A E. A G E F is the square required.



FRENCH.—XII

[*Continued from p.* 289.]

REFLECTIVE VERBS CONJUGATED WITH *EN*.

THE verb *aller* (1, ir.), used pronominally, and preceded by the word *en*, i.e. *s'en aller*, corresponds to the English expressions *to go away*, *to leave* :—

INDICATIVE PRESENT OF THE VERB S'EN ALLER.

Je m'en vais,	*I go away.*	Nous nous en allons,	*We go away.*
Tu t'en vas,	*Thou art going away.*	Vous vous en allez,	*You are going away.*
Il s'en va,	*He goes away.*	Ils s'en vont,	*They go away.*

THE SAME TENSE CONJUGATED INTERROGATIVELY.

Est-ce-que je m'en vais?	*Do I go away.*	Nous en allons-nous?	*Do we go away?*
T'en vas-tu?	*Art thou going away?*	Vous en allez-vous?	*Do you go away?*
S'en va-t-il?	*Is he going away?*	S'en vont-ils?	*Are they going away?*

Se fâcher, *to be*, or *become angry*, requires the preposition *contre* or *de* before the noun or pronoun following it:—

Se fâche-t-il contre votre frere?	*Does he become angry against your brother?*
Il se fâche contre lui.	*He is angry with him.*
Vous vous fâchez d'un rien.	*You get angry at nothing.*

Se réjouir, *to rejoice*, is followed by the preposition *de* :—

Je me réjouis de votre bonheur.	*I rejoice at your happiness.*

Se plaire (4, ir.), *to take pleasure, to delight in anything, to like to be in a place*, takes *à* before its object:—

Je me plais à la campagne.	*I like to be in the country.*
Je me plais à étudier, à lire.	*I take pleasure in studying, in reading.*

Se dépêcher, se hâter, *to make haste*, take *de* before their object:—

Dépêchez-vous de finir vos leçons.	*Make haste to finish your lessons.*
Pourquoi ne vous dépêchez-vous pas?	*Why do you not make haste?*

MISCELLANEOUS EXAMPLES.

Le marchand s'en va-t-il aujourd'hui?	*Does the merchant go away to-day?*
Nous nous en allons demain.	*We are going away to-morrow?*
Pourquoi vous fâchez-vous contre lui?	*Why do you get angry with him?*
Il se plait à jouer il n'étudie jamais.	*He takes pleasure in playing, he never studies.*
Vous plaisez-vous chez vos parents?	*Do you like to be at the house of your relations?*
De quoi vous réjouissez-vous?	*At what do you rejoice?*
Nous nous réjouissons de votre succès.	*We rejoice at your success.*
Pourquoi vous dépêchez-vous?	*Why do you make haste?*
Nous nous dépêchons d'écrire.	*We make haste to write.*
Nous nous plaisons en Angleterre.	*We like to be in England.*
Nous ne nous y plaisons pas.	*We do not like to be there.*

VOCABULARY.

- **Ambassadeur**, m. *ambassador.*
- **Arrivée**, f. *arrival.*
- **Autrui**, m. *others.*
- **Avec**, *with.*
- **Cour-ir**, 2, ir. *to run.*
- **Jamais**, *never.*
- **Jou-er**, 1, *to play.*
- **Malheur**, m. *misfortune.*
- **Midi**, m. *noon.*
- **Mieux**, *better.*
- **Ouvrage**, m. *work.*
- **Retourn-er**, 1, *to return.*
- **Tante**, f. *aunt.*
- **Turc, turque**, *Turkish.*

EXERCISE 83.

Translate into English :—

1. Vous en allez-vous bientôt? 2. Je m'en vais la semaine prochaine. 3. Pourquoi vous en allez-vous? 4. Parce que je ne me plais pas ici. 5. Vous plaisez-vous mieux chez votre tante qu'ici? 6. Je m'y plais mieux. 7. N'avez-vous pas tort de vous en aller si tôt? 8. J'ai raison de m'en aller. 9. Ne vous réjouissez-vous pas des malheurs d'autrui? 10. Nous ne nous en réjouissons point. 11. Cet homme se fâche-t-il contre le jardinier? 12. Il se fâche contre lui parce qu'il ne veut pas se dépêcher. 13. Se fâche-t-il bien souvent? 14. Il se fâche à tout moment, il se fâche d'un rien. 15. Ne vous dépêchez-vous jamais? 16. Je me dépêche toujours quand j'ai quelque chose à faire. 17. Ne vous plaisez-vous pas à courir et à jouer? 18. Je me plais à jouer et mon frère se plaît à lire. 19. Vous réjouissez-vous de l'arrivée de l'ambassadeur turc? 20. Je m'en réjouis. 21. Ne vous plaisez-vous pas en Amérique? 22. Je m'y plais beaucoup mieux qu'en France. 23. Votre écolier ne se plaît-il pas chez vous? 24. Il se plaît chez moi, mais il désire retourner chez son père. 25. Dépêchez-vous, il est déjà midi.

EXERCISE 84.

Translate into French :—

1. At what hour does your friend go away? 2. He goes away every morning at nine o'clock. 3. Do you go away with him? 4. I go away with him when I have time. 5. Will you make haste to finish your letter? 6. I make haste to finish it. 7. Does the gardener get angry with his brother? 8. He gets angry against him when he does not make haste. 9. Make haste, my friend, it is ten o'clock. 10. Why do you not make haste? 11. I like to play, but I do not like to study. 12. Do you like to stay at my house? 13. I like to stay there. 14. Are you pleased at the arrival of your mother? 15. I rejoice at it. 16. Is not your brother wrong to go away so soon? 17. He is right to go away, he has much to do at home. 18. Do you rejoice at other people's misfortunes? 19. I do not rejoice at them. 20. I rejoice at your success. 21. Does not your brother draw near the fire? 22. He goes from the fire, he is too warm. 23. Does that young lady get angry with you? 24. She gets angry at trifles (lit., at nothing). 25. Do you like to be in Paris? 26. I like to be there. 27. Can you do without me to-day? 28. We cannot do without you—make haste to finish your work.

USE OF THE AUXILIARIES.

All transitive verbs take *avoir* as auxiliary :—

Nous avons écrit à notre banquier.	*We have written to our banker.*

Almost all intransitive verbs take the auxiliary *avoir* when they express action :—

Nous avons couru, marché, parlé.	*We have run, walked, spoken.*

The compound tenses of a few neuter verbs, expressing action, are, however, conjugated with *être*, viz. : **aller**, *to go ;* **arriver**, *to arrive ;* **choir**, **tomber**, *to fall ;* **décéder**, **mourir**, *to die ;* **venir**, *to come*, **parvenir**, *to succeed ;* **revenir**, *to return*, etc. :—

À quelle heure êtes-vous venu?	*At what hour did you come?*

A few neuter verbs take *avoir* when they express action, and *être* when they express situation :—

Votre frère a-t-il sorti ce matin?	*Has your brother gone out this morning?*
Votre frere est-il sorti?	*Is your brother gone out?*

The past indefinite of the verb *être* (*J'ai été*, &c.) is used instead of the preterite indefinite of *aller* (*Je suis allé*) when speaking of a place where one *has* been, with this difference, however, that *être* implies return from such place, whilst *aller* does not. The verb "to be" in English is used in a precisely similar way :—

Le médecin a été à Paris.	*The physician has been at Paris.*
J'ai été à l'église ce matin.	*I went to church this morning.*

When we are still in a given place, or on the road towards it, the expression *Je suis allé*, &c., must be used :—

Le médecin est allé à Londres.	*The physician is gone to London.*
Votre sœur est allée à l'église.	*Your sister is gone to church.*

MISCELLANEOUS EXAMPLES.

Avez-vous été au bal hier au soir?	*Did you go to the ball last evening?*
Nous n'y avons pas été.	*We did not go.*
Où votre sœur est-elle allée ce matin?	*Where is your sister gone this morning?*
Elle est allee trouver sa cousine	*She is gone to her cousin's.*
N'avez-vous pas sorti aujourd'hui?	*Did you not go out to-day?*
Je n'ai pas encore sorti.	*I have not yet been out.*
Monsieur le général est sorti.	*The general is gone out.*
Elle a eté le voir hier.	*She went to see him yesterday (and is back).*
Elle est allée le voir hier.	*She went to see him yesterday (and is not back).*

VOCABULARY.

- **Bijouterie**, f. *jewellery.*
- **Chapelier**, m. *hatter.*
- **Espagne**, f. *Spain.*
- **Maçon**, m. *mason.*
- **Malade**, *sick*, or *ill.*
- **Marchandise**, f. *merchandise.*
- **Naître**, 4, ir. *to be born.*
- **Né**, *born.*
- **Orfèvre**, m. *goldsmith.*
- **Retour**, m. *return;* de retour, *back.*
- **Retourn-er**, 1, *to return.*
- **Venu**, *from* venir, 2, ir. *come.*

EXERCISE 85.

Translate into English:—

1. À quelle heure votre sœur est-elle venue? 2. Elle est venue à huit heures moins un quart. 3. Ces demoiselles sont-elles nées à Rouen ou à Caen? 4. Elles ne sont nées ni à Rouen ni à Caen, elles sont nées à Strasbourg. 5. L'horloger est-il chez lui? 6. Non, Monsieur, il est allé à son magasin. 7. A-t-il été à Paris cette année? 8. Oui, Madame, il y a été. 9. Y a-t-il acheté des marchandises? 10. Il y a acheté de la bijouterie. 11. Avez-vous été trouver mon père? 12. J'ai été le trouver. 13. Votre chapelier a-t-il sorti aujourd'hui? 14. Il n'a pas sorti, il est malade. 15. Le maçon est-il à la maison? 16. Non, Madame, il est sorti. 17. Quand est-il sorti? 18. Il est sorti il y a une heure. 19. Votre chapelier est-il arrivé aujourd'hui ou hier. 20. Il est arrivé hier à quatre heures du matin. 21. Notre tailleur a-t-il été voir son père aujourd'hui? 22. Il est parti pour Lyon. 23. L'orfèvre de mon cousin n'est-il pas parti pour l'Espagne? 24. Non, Monsieur, il est retourné en Allemagne. 25. Ma sœur a été à l'église ce matin, et elle est allée à l'école il y a une demi-heure.

EXERCISE 86.

Translate into French:—

1. Is the physician at home? 2. No, Sir, he is not at home; he is out. 3. Have you been out this morning? 4. No, Sir, I have not been out; I am ill. 5. Is your sister's little girl out? 6. Yes, Sir, she is out; she is at my brother's. 7. At what hour did the hatter arrive? 8. He arrived last evening at nine. 9. Did the jeweller go to Paris or Lyons this year? 10. He went to Paris six months ago, but he is back. 11. Did you go to my brother or to my sister? 12. I have not had time to go to them. 13. Where was that gentleman born? 14. He was born in England, in Exeter or in Portsmouth. 15. Was not your sister born in Paris? 16. No, Sir, she was born in Madrid, in Spain. 17. Did you tell me that your brother had bought a good house? 18. He has bought a very good house in London. 19. Do you know at what time the watchmaker arrived? 20. He arrived this morning at a quarter to five. 21. Has he brought much jewellery? 22. He has not brought much jewellery, but he has brought many watches. 23. Has he been in France or in Germany? 24. He has been in France, in Germany, and in Switzerland. 25. Is your sister at home, Sir? 26. No, Sir, she is out; she is gone to church. 27. Did she go to school yesterday? 28. She went to school and to church. 29. Is she there now? 30. No, Sir, she is back. 31. Is the hatter arrived? 32. Yes, Sir, he is arrived. 33. When did he arrive? 34. He arrived yesterday at nine o'clock in the morning.

IDIOMATIC EXPRESSIONS: *COMBIEN*, *MENER*, ETC.

Combien de temps corresponds with the English expression, *how long*.

Combien de temps avez-vous demeuré en Italie?	*How long did you live in Italy?*

Combien de fois answers to the English, *how often*, *how many times*.

Combien de fois y avez-vous été?	*How many times have you been there?*

Jusqu'où is used for *how far*, *what distance*, etc.

Jusqu'où avez-vous été?	*How far have you been?*

Jusqu'à quelle heure (*till what hour*) means also *how late*.

Jusqu'à quelle heure avez-vous attendu?	*How late did you wait?*

D'où means *whence*; **par où**, *which way*, *in what direction*.

D'où venez-vous, mon ami?	*Whence do you come, my friend?*
Par où votre ami est-il alle?	*Which way is your friend gone?*

Mener, porter, *to take, to carry*; **amener, apporter,** *to bring, to take with one*; **emmener, emporter,** *to take, to carry away*. We use **mener, amener, emmener,** for *to take, to bring, to take away*, in the sense of *conducting, leading, guiding, on foot or in a vehicle*. **Porter, apporter, emporter,** mean *to carry, to bring, to carry away*, etc.

Menez votre sœur à l'école.	*Take your sister to school.*
Portez ce livre à votre sœur.	*Take this book to your sister.*

MISCELLANEOUS EXAMPLES.

Jusqu'où votre frère est-il allé?	*How far is your brother gone?*
Il est allé jusqu'a Paris.	*He is gone as far as Paris.*
Combien de temps va-t-il y rester?	*How long is he going to stay there?*
Il va y rester jusqu'au printemps.	*He is going to stay there until spring.*
Combien de temps avez-vous demeuré à Londres?	*How long did you live in London?*
Nous y avons demeuré six ans.	*We lived there six years.*
Jusqu'où avez-vous été?	*How far did you go?*
Nous avons éte jusqu'aux Champs Élysees.	*We went as far as the Champs Élysées.*
Jusqu'à quelle heure avez-vous écrit?	*How late did you write?*
J'ai écrit jusqu'à minuit.	*I wrote until midnight.*
D'où viennent ces Allemandes?	*Whence come those German ladies?*
Elles viennent d'Aix-la-Chapelle.	*They come from Aix-la-Chapelle.*
Par où sont-elles venues?	*Which way did they come?*
Elles sont venues par Bruxelles.	*They came by Brussels.*
Menez-vous cette petite fille à l'école?	*Do you take (lead) this little girl to school?*
Je ne l'y mène pas, je l'y porte; elle est trop petite pour marcher.	*I do not lead her there, I carry her there; she is too young to walk.*
Amenez-vous vos enfants?	*Do you bring your children?*
Portez-vous une lettre à la poste?	*Do you take a letter to the post-office?*
J'emmène mon cheval, j'emporte ma montre.	*I bring away my horse; I bring away my watch.*

VOCABULARY.

Ainé, *eldest.*
Bruit, m. *noise.*
Élève, m. *pupil.*
Fin, -e, *fine.*
Loin, *far.*
Magnifique, *magnificent.*
Midi, *noon.*
Nouvelle, f. *news.*
Pied, m. *foot.*
Quitt-er, 1, *to leave.*
Soieries, f. p. *silk goods.*

EXERCISE 87.

Translate into English :—

1. Le jeune homme est-il allé loin? 2. Il n'est pas allé bien loin, il n'est allé que jusqu'à Paris. 3. Vos enfants font trop de bruit, pourquoi ne les emmenez-vous pas? 4. Ils sont malades, ils ne peuvent marcher. 5. Comment les avez-vous amenés ici? 6. Je les ai amenés en voiture. 7. À quelle heure amenez-vous le médecin? 8. Je l'amène tous les jours à midi. 9. Combien de fois par jour menez-vous vos élèves à l'église? 10. Je les mène à l'église deux fois par jour. 11. Combien de fois y avez-vous été? 12. J'y ai été plusieurs fois. 13. Par où ces voyageurs sont-ils venus? 14. Ils sont venus par Amiens et par Rouen. 15. D'où apportez-vous cette nouvelle? 16. Je l'apporte de Cologne. 17. D'où avez-vous amené ces superbes chevaux? 18. Je les ai amenés d'Angleterre. 19. Si vous quittez la France, avez-vous l'intention d'emmener votre fils?

EXERCISE 88.

Translate into French :—

1. How long did your son live in London? 2. He lived there ten years. 3. How far is the physician gone? 4. The physician is gone as far as Cologne. 5. Has he taken his son with him? 6. He has not taken him. 7. How have you brought your two little girls? 8. I brought one in a carriage, and I carried the other. 9. Is she too little to walk? 10. She is not too little to walk, but she is ill. 11. Have you brought your horse? 12. We have brought two horses. 13. Have you brought the books which you have promised me. 14. I have forgotten to bring them. 15. Has that lady brought her eldest son? 16. She has brought all her children? 17. How did they come? 18. They came in a carriage. 19. Which way did your brother come from Germany? 20. He came by Aix-la-Chapelle and Brussels. 21. Do you intend to take your son to school this afternoon? 22. I do not intend to take him there, it is too cold. 23. Is that child too ill to walk? 24. He is too ill to walk, and I intend to carry him. 25. Why do you not take him in a carriage? 26. My brother has taken my horse away. 27. Have you brought the physician? 28. I have not brought him; no one is ill at our house. 29. Will you take this book to church?

REFLECTIVE AND IMPERSONAL VERBS.

Pronominal verbs take *être* as auxiliary—

Votre cousin s'est promené.	*Your cousin has taken a walk.*
Nos amis se sont flattés.	*Our friends have flattered themselves.*

Although the compound tenses of pronominal verbs are conjugated with *être*, their past participle agrees with the direct object, when that object precedes the auxiliary, and is invariable when such object follows the participle. The student should be very careful to see if the reflective pronoun be a direct or an indirect object.

Vous vous êtes flattées, Mesdemoiselles	*You have flattered yourselves, young ladies.*
Elles se sont donné la main.	*They have given (to) each other the hand.*
La voiture qu'il s'est donnée est belle.	*The carriage he has given to himself is beautiful.*

It will be easily perceived that *vous* in the first sentence is a *direct* object, and that *se* in the second and in the third represents an *indirect* object, the direct object of the third being *que*, which, standing for *voiture*, and preceding the auxiliary, governs the past participle *donnée* in the feminine singular.

Verbs naturally impersonal—*i.e.*, verbs which are not used otherwise—take *avoir* as an auxiliary—

Il a plu, il a neigé, il a gelé.	*It rained, it snowed, it froze.*

Verbs occasionally used in the impersonal form, preserve their proper auxiliary—

Il lui est arrivé un malheur.	*A misfortune has happened to him.*
A-t-il fait beau temps le mois passe?	*Was it fine weather last month?*
Y a-t-il eu beaucoup de monde?	*Were there many people there?*

The participle past of an impersonal verb is always invariable—

Les pluies qu'il y a eu cet eté.	*The rain which we have had this summer.*

MISCELLANEOUS EXAMPLES.

Les dames se sont promenées.	*The ladies have taken a walk.*
Nous nous sommes aperçus de çela.	*We perceived that,* or *we took notice of that.*
Votre mère s'est-elle bien portée?	*Has your mother been well?*
Vos sœurs se sont-elles assises?	*Did your sisters sit down?*
Cette marchandise s'est-elle bien vendue?	*Did that merchandise sell well?*
Vos enfants se sont-ils appliqués a l'étude?	*Did your children apply to study?*
Nous nous sommes donné de la peine.	*We gave* (*to*) *ourselves much trouble.*

VOCABULARY.

Acier, m. *steel.*
Grêl-er, 1, pec. *to hail.*
Neig-er, 1, pec. *to snow.*
Peine, f. *trouble.*
Plu, *from* pleuvoir, *rained.*
Plume, f. *pen.*
Se port-er, 1, ref. *to be* or *do.*
Se tromp-er, 1, ref. *to be mistaken.*
Se serv-ir, 2 ir. ref. *to use.*
Se vend-re, 4, ref. *to sell.*
S'aperç-evoir, 3, ref. *to perceive.*
S'asse-oir, 3 ir. ref. *to sit down.*
S'ennuy-er, 1, pec. *to grow weary.*

EXERCISE 89.

Translate into English :—

1. À qui vos sœurs se sont-elles adressées? 2. Elles se sont adressées à moi. 3. Ne se sont-elles pas trompées? 4. Elles se sont trompées. 5. Vous êtes-vous aperçu de votre erreur? 6. Je ne m'en suis pas aperçu. 7. Vous êtes-vous ennuyés à la

campagne? 8. Nous nous y sommes ennuyés. 9. Ces demoiselles se sont-elles ennuyées chez vous? 10. Elles s'y sont ennuyées. 11. De quoi vous êtes-vous servie pour écrire, Mademoiselle? 12. Je me suis servie d'une plume d'or.

EXERCISE 90.

Translate into French :—

1. Has it rained to-day? 2. It has not rained, but it has hailed and snowed. 3. Has anything happened to your little boy? 4. Nothing has happened to him, but he is ill to-day. 5. Did your sister sit down at your house? 6. She did not sit down; she was ill. 7. Did that cloth sell well? 8. It sold very well; we have sold it all. 9. Did you perceive your error (*erreur*)? 10. We perceived it. 11. Were not your sisters mistaken in this affair? 12. They were not mistaken.

KEY TO EXERCISES.

Ex. 75.—1. What is that gentleman's name? 2. I do not know his name. 3. Is not that lady called L.? 4. No, Madam, she is called M. 5. Is your father well this morning? 6. He is much better. 7. Is it fine weather to-day? 8. It is magnificent weather; are you not going to take a walk? 9. We have neither horse nor carriage, 10. Can you not walk? 11. I am too weary to walk. 12. Do you not take a ride every morning? 13. I take a walk every morning. 14. How do you go? 15. Sometimes on foot, and sometimes in a carriage. 16. To whom do you apply when you want money? 17. I apply to my banker. 18. Will you not sit down? 19. We are much obliged to you.

Ex. 76.—1. Mlle. votre sœur se promène-t-elle tous les jours? 2. Elle se promène tous les matins. 3. Elle aime à aller à cheval et en voiture. 4. Comment cette petite fille s'appelle-t-elle? 5. Elle s'appelle L.? 6. Ce Monsieur ne s'appelle-t-il pas L.? 7. Non, Monsieur, il s'appelle G., et son cousin s'appelle H. 8. Comment se porte M. votre frère? 9. Mon frère se porte très bien, mais ma sœur ne se porte pas bien. 10. Comment vos deux filles se portent-elles? 11. Elles se portent passablement bien aujourd'hui. 12. Messieurs, ne voulez-vous pas vous asseoir? 13. Nous vous sommes bien obligés, Madame, nous n'avons pas le temps. 14. Ce livre se vend-il bien? 15. Il se vend très bien. 16. Combien cette soie se vend-elle le yard? 17. Elle se vend six francs le yard. 18. Fait-il beau temps aujourd'hui? 19. Il fait très beau temps, ne voulez-vous pas aller vous promener? 20. Je n'ai pas le temps d'aller me promener. 21. À qui M. votre frère s'adresse-t-il? 22. Il s'adresse à son banquier. 23. Son frère est-il à la maison? 24. Non, Monsieur, il est à Paris. 25. Quand a-t-il l'intention d'aller en France? 26. Il a l'intention d'aller en France dans un mois. 27. Mlle. votre sœur, doit-elle partir demain matin? 28. Elle doit partir aujourd'hui, s'il fait beau temps. 29. Que dit-on de ceci? 30. On n'en dit rien. 31. Êtes-vous trop fatigué pour marcher? 32. Je ne suis pas trop fatigué, mais je n'ai pas envie de me promener. 33. Aimez-vous à marcher, ou à aller à cheval? 34. J'aime à aller à cheval, quand j'ai un bon cheval. 35. Je n'aime pas à marcher.

Ex. 77.—1. Does the hair-dresser cut his thumb? 2. No, Sir, he does not cut his thumb. 3. Does not the carpenter cut his hand? 4. He does not cut his hand. 5. Do you not remember that lady? 6. I remember that lady and those gentlemen. 7. With what do you occupy yourselves? 8. We occupy ourselves with our affairs. 9. Do you remember your father's guns? 10. I do not remember them at all. 11. Does not that little girl burn herself? 12. She does not burn herself, there is no fire in the stove. 13. Why does not the butcher warm himself? 14. Because he is not cold. 15. Do those children rise earlier than I? 16. They go to bed early, and rise every morning at six o'clock. 17. Will not your partner sit down? 18. He has no time to sit down. 19. Do you remember your promises? 20. I remember them perfectly. 21. Do you not warm yourself when you are cold? 22. I hardly ever warm myself. 23. Do we not go to bed when we are sleepy? 24. One goes to bed when one is sleepy, and eats when one is hungry. 25. When one is well, does one rise early? 26. When one is in good health, one should rise early.

Ex. 78.—1. Vous levez-vous de bonne heure quand vous vous portez bien? 2. Quand je me porte bien, je me lève tous les matins à cinq heures. 3. Vous rappelez-vous votre cousin L.? 4. Je me le rappelle parfaitement bien. 5. Vous couchez-vous de bonne heure? 6. Nous nous couchons à dix heures. 7. Le tailleur ne se brûle-t-il pas les doigts? 8. Il ne se brûle pas les doigts, son fer n'est pas chaud. 9. Le charpentier se coupe-t-il le pouce? 10. Il ne se coupe ni le pouce ni la main. 11. Pourquoi ne vous chauffez-vous pas? 12. Je ne me chauffe pas, parce que je n'ai pas froid. 13. Ne fait-il pas très froid aujourd'hui? 14. Il ne fait pas froid aujourd'hui, il pleut. 15. Votre perruquier se lève-t-il au lever du soleil? 16. Le charpentier se lève au lever du soleil, et il se couche au coucher du soleil. 17. Vous levez-vous de meilleure heure que moi? 18. Nous nous levons tous les matins au point du jour. 19. Vous coupez-vous souvent les cheveux? 20. Je me coupe les cheveux tous les mois. 21. Vous rappelez-vous ce monsieur? 22. Je me le rappelle très bien. 23. Je ne me le rappelle pas. 24. Vous coupez-vous les doigts, quand vous taillez une plume? 25. Je me coupe la main parfois quand je travaille. 26. Vous souvenez-vous de ce que vous apprenez? 27. Je ne me souviens pas de tout ce que j'apprends. 28. Savez-vous si M. votre père se porte bien? 29. Il se porte fort bien aujourd'hui. 30. Mme. votre mère ne se porte-t-elle pas bien? 31. Elle ne se porte pas très bien. 32. Vous souvenez-vous des malheurs de votre ami? 33. Je m'en souviens. 34. Je me rappelle cela.

Ex. 79.—1. Do you like to live in the country? 2. I prefer the country to the city. 3. Do you often become weary in the country? 4. When I become weary of the country, I return to the city. 5. Do they hear from General L.? (*Is anything heard from General L.?*) 6. Nothing is heard of him. 7. Are you sometimes mistaken? 8. Everybody is mistaken sometimes. 9. Does the banker deceive his clients? 10. He deceives neither his clients nor his friends; he deceives nobody. 11. Are you not mistaken in this bill? 12. I am not mistaken. 13. Do you amuse yourself in reading or in writing? 14. I amuse myself in learning German and French. 15. Are you wrong to learn languages? 16. I am right to learn them. 17. Do you often become weary (*feel ennui*)? 18. I become weary when I have nothing to do. 19. How do you amuse yourself when you are in the country? 20. We walk in the morning, and work the remainder of the day.

Ex. 80.—1. Ne vous trompez-vous pas? 2. Je ne me trompe pas. 3. Le banquier ne se trompe-t-il pas? 4. Il ne se trompe pas, mais son commis se trompe certainement. 5. Ne vous trompe-t-il pas? 6. Il ne me trompe pas, il ne trompe personne. 7. N'avez-vous pas tort de tromper votre père? 8. Je n'ai pas l'intention de le tromper. 9. Le marchand ne se trompe-t-il pas? 10. Il se trompe dans le mémoire qu'il écrit. 11. Aimez-vous la campagne ou la ville? 12. Je préfère la ville, je m'ennuie bientôt à la campagne. 13. Cet enfant ne vous ennuie-t-il pas par ses questions? 14. Cette longue

histoire ne vous ennuie-t-elle pas? 15. Elle ne m'ennuie pas, elle m'amuse. 16. Vous amusez-vous quand vous êtes à la campagne? 17. Je m'y amuse, j'apprends le français et l'italien. 18. Ne vous ennuyez-vous pas chez votre oncle? 19. Je ne m'y ennuie jamais. 20. M. votre frère se trompe-t-il souvent? 21. Tout le monde se trompe quelquefois.

Funeral of Oliver Cromwell.

Ex. 81.—1. Can you do without ink? 2. We can do without it, we have nothing to write. 3. Do you use your pen? 4. I am not using it; do you want it? 5. Will you not draw near the fire? 6. I am much obliged to you, I am not cold. 7. Why do those young ladies go from the window? 8. They leave it because it is too cold there. 9. Do not those children apply to you? 10. They apply to me and to my brother. 11. At what hour do you awake in the morning? 12. I awake generally at a quarter to six. 13. Do you rise as soon as you awake? 14. I rise as soon as I awake. 15. What books do you use? 16. I use mine and yours. 17. Do you not use your brother's? 18. I use them also. 19. Are the pens which you use good? 20. Why does your friend draw back from the fire? 21. He draws back because he is too warm. 22. Why does your servant draw near it? 23. He draws near it to warm himself. 24. Are you becoming weary of being here? 25. I am not weary of it.

Ex. 82.—1. Voulez-vous me prêter votre canif? 2. Je ne puis m'en passer, j'en ai besoin pour tailler ma plume. 3. Voulez-vous vous servir de mon livre? (*Avez-vous besoin de mon livre?*) 4. J'ai besoin de m'en servir, voulez-vous me le prêter? 5. De quel couteau M. votre frère se sert-il? 6. Il se sert du couteau de mon père et de la fourchette de mon frère. 7. Ne voulez-vous pas vous approcher du feu? 8. Nous vous sommes bien obligés, nous avons chaud. 9. Cette demoiselle a-t-elle assez chaud? 10. Elle a très froid. 11. Dites-lui de s'approcher du feu. 12. Pourquoi vous éloignez-vous du feu? 13. Nous avons trop chaud. 14 M. votre frère s'éloigne-t-il de la fenêtre? 15. Il s'éloigne de la fenêtre parce qu'il a froid. 16. À qui ce monsieur s'adresse-t-il? 17. Il s'adresse à moi et à mon frère. 18. Pourquoi ne s'adresse-t-il pas à moi? 19. Parce qu'il a honte de vous parler. 20. Vous éveillez-vous de bonne heure tous les matins? 21. Je m'eveille de bonne heure quand je me couche de bonne heure. 22. Pourquoi vous endormez-vous? 23. Je m'endors parce que je suis fatigué. 24. Avez-vous peur de vous approcher de votre père? 25. Je n'ai pas peur de m'approcher de lui. 26. Pouvez-vous vous passer de nous? 27. Nous ne pouvons nous passer de vous, mais nous pouvons nous passer de votre frère. 28. Avez-vous besoin du cheval de mon frère? 29 Non, Monsieur, nous pouvons nous en passer. 30. Avez-vous l'intention de vous passer d'argent? 31. Vous savez très bien que nous ne pouvons nous en passer.

HISTORIC SKETCHES, ENGLISH.—XII.

[*Continued from p.* 282.]

THE PROTECTOR OF THE COMMONWEALTH.

At the Royal Palace of Whitehall, on the 3rd of September, 1658, a man lay dying. Eight days before he felt so confident of life that he told his wife not to think he should die, as he felt sure of the contrary. Now—he was speechless, sinking; and the last thing about which he had seriously troubled himself was a curious theological point. "Tell me," he said to Sterry, a minister who stood by him, "is it possible to fall from grace?" "It is not possible," said the minister. "Then," exclaimed the dying man, "I am safe; for I know that I was once in grace."

The dying man was Oliver Cromwell, Lord Protector of England and Ireland, the man who for ten years had governed the kingdom in a right kingly way, and made it stronger and more respected by all foreign powers than it had been since the days of Henry V. and Agincourt; the man who had subverted the subverters of the monarchy, and had yet annihilated monarchy itself in the person of his own king; who had overcome all rivals, punished all rebels against his own authority, and seated himself firmly on the throne of kings, though he had refused the name and emblems of royalty.

It was the 3rd of September, the day Cromwell was wont to call his fortunate day. On a 3rd of September he overcame the Scots' army at Dunbar; on a 3rd of September he had fought the Battle of Worcester, "the Lord's crowning mercy to him," as he called it. His wife and his friends hoped much from this circumstance, that the worst of the fever seemed to come upon him on this his fortunate day. Fortunate indeed if he could realise in his own case the assertion of the wise king, that the day of one's death is better than the day of one's birth.

Whether he was to be blamed or not for the part he had taken in the recent troubles, the result to him was the same: the weight of the Government pressed heavily upon his shoulders, and he found at the end of ten years that all he had for his labour was vanity and vexation of spirit. Fatigue of body and mind was supplemented latterly by a spring of bitterness welling up within, sapping the strong man's energy, gnawing away at the very vitals of his strength, overwhelming him with a dreadful sense of responsibility and fear lest he had striven in vain and in the wrong direction. Once he had felt no hesitation about what he should do, and believed that his decision was an inspiration direct from the Spirit of the Almighty; now he doubted whether all things were lawful or expedient unto him. Once he had felt no difficulty in telling his troopers, by way of assurance against their fears as to the propriety of offering personal violence to the king, "If I should meet the king in battle, I would shoot the king;" now he was uneasy in his mind when even his favourite daughter, Mrs. Claypole, suggested to him doubts as to the integrity of his conduct in the sight of God. Even his old friends, the men who had stood by him through good report and evil, until his genius eclipsed them and turned them into rivals and opponents, these too had forsaken him, and left him alone in the State. Then he found how, without being bitter, a man's household may be among his foes. His mother, a homely woman, quite incapable of realising the magnitude and the difficulties of her son's position, disquieted him in return for his filial devotion to her with the expression of her convictions that they and the like of them had no business in the royal palaces. His children were incapable, excepting perhaps Henry, of appreciating his statesmanship and his motives, and were therefore divided from him by the great gulf of want of sympathy; while some of them, if the accounts of those times are to be trusted, actually reproached him for what he had done for the country. On one side a numerous and implacable enemy, burning with desire to revenge the unpardonable death of "the royal martyr," and the losses they had incurred in his behalf—on the other side a formidable array of enemies who had once been friends and associates; the hatred of foreign nations, only kept from finding expression by the fear inspired by his sword; chronic rebellion at home; within the camp lukewarm allies, ready to fall away like water as soon as they should "perceive the least rub in his fortunes;" his own kith and kin not with him, and uneasy in his own mind about grace and acceptance; doubtful, too, as has been said, whether or not he had striven in vain for the ultimate good of his country—what comfort could he have in living?

In August, 1658, he was at Hampton Court Palace, watching the sure progress of disease in the body of his best beloved child, Elizabeth Claypole. He was, and had been for some time, far from well, but the absorbing distractions of his daughter's state made him oblivious or indifferent to his own ills. On the 6th of August the strongest link of affection that bound him to the world was snapped; Elizabeth Claypole died, and then the Protector found out, what other men had known long since, that he was very ill. For a time he distracted himself by the sad cares of the last offices for his daughter, whom he caused to be buried with imperial pomp among kings and queens in Westminster Abbey; but this done he had leisure to find out that he was mortal. At the moment of his daughter's death he was confined to his bed with gout, and upon that fever supervened. His pulse became intermittent, but his physicians did not seem to be anxious, and he, on his wife expressing her fears as to the issue of his illness, bade her be sure he should not die, since he knew he should not "from better authority than any which you can have from Galen or Hippocrates. It is the answer of God Himself to our prayers; not to mine alone, but to those of others who have a more intimate interest in Him than I have."

For sake of the change he had moved from

Hampton Court to Whitehall, where he took to his bed, and within a month of his daughter's decease he had followed her to her long home. Thurloe, his faithful secretary and most devoted friend, announced the event to the Deputy of Ireland in a letter wherein he said of Cromwell, "He is gone to heaven, embalmed with the tears of his people, and upon the wings of the prayers of the saints."

With a magnificent ceremonial, copied from that which was used at the funeral of the Spanish King Philip II., in 1598, the Republican Government laid the body of Oliver Cromwell in Westminster Abbey, where it remained with those of princes and senators till the restoration of the monarchy, when the spirit of revenge wreaked itself on the corpse of the spoiler of kings by causing it to be exposed on the gallows at Tyburn, and then buried in a hole like the carcase of a dog. To Cromwell himself it could scarcely have mattered much where they laid his body or what they did with it after he had done with it; the splendid funeral at St. Peter's was as little in accordance with his habits and ways as the ignominious barbarity at Tyburn. He was beyond the reach of honour and dishonour, insensible to flattery as to blame; but to those who remained these two ceremonials signified something. What had Cromwell done that gave significance to them?

Oliver Cromwell was born on April 25, 1599, at Huntingdon, and was the son of a country gentleman of moderate estate, who was of the same family as that Thomas Cromwell, Cardinal Wolsey's favourite secretary, who was made Earl of Essex by Henry VIII., and was afterwards beheaded by him. Oliver was sent to the university, where he made but small proficiency in his studies, and fell, it is said, into some wild courses. Reforming his mode of life, however, on a sudden but sincere conviction that it was a wrong one, Cromwell married, and at the same time warmly embraced the Puritan faith, which was then beginning to acquire great influence throughout the country. For reasons of economy he gave up housekeeping as a country gentleman, and farmed some land which he took near St. Ives; but his operations in this direction were not successful, the duties of the farmer being probably neglected for those of the religious politician. In conjunction with his kinsman, John Hampden, he formed a project of emigrating to America, believing that there alone he could live in the enjoyment of that freedom of conscience and of political action which was denied to him and his brethren here. How that project was frustrated by royal order, on the very eve of completion, has already been shown at length in a previous sketch.

Soon after the veto was put on his emigration Cromwell was sent to Parliament as member for the town of Cambridge, and though he seldom spoke, and when he did, not in a way to captivate or lead the House, his vote was invariably to be found in the lists of those who had maintained the popular right against the kingly power. He did not take a prominent part in the political and domestic matters which brought about the rupture between the king and the Parliament, but he made good use of his time, and of his great powers of observation and reflection, to make up his mind both as to the righteousness of the common cause, and as to the integrity and capacity of the men engaged on both sides of it.

In all important points before the breaking out of civil war we find him voting on the popular side, lending whatever weight his influence had to the cause of liberty; and when by the flight of the king from London, and by the rearing of the royal standard at Nottingham, August 25, 1642, war became inevitable, Cromwell, then in his forty-third year, was among the first to offer his sword to the Parliament, and he was forthwith commissioned to raise a troop of horsemen to serve in the Parliamentary army. This troop, which he soon increased to a regiment, he raised from among the yeomen and well-to-do farmers in Cambridgeshire and the neighbouring counties, ensuring thereby a certain amount of education among his men, and a large admixture of that free spirit which cannot grow but in an independent atmosphere. He severely disciplined his recruits till they became the famous "Ironsides," dreadful in battle; he preached to them, prayed with them, fought with them, and by cool courage and fervent zeal succeeded in inspiring them with a belief that a prophet had risen up among them.

First at Gainsborough, and then at Horncastle, in Yorkshire, Cromwell displayed his military ability as a general, by defeating with severe loss some divisions of the Royalist army under the Marquis of Newcastle; and soon afterwards, in 1644, he was appointed second in command of the Parliamentary army operating in the eastern counties under the Earl of Manchester. In conjunction with Fairfax and Lambert, the Earl of Manchester, having been victorious in the east, marched to York and besieged it, the issue being the battle of Marston Moor, where the cavalry and infantry under the command of Oliver Cromwell broke the serried ranks of Prince Rupert, and carried the day "for God and the Houses."

At Dennington Castle, near Newbury, where King Charles had left his baggage and artillery after the rout of his army at the latter place, a difference arose between Cromwell and the Earl of Manchester which first showed the firmness and dominancy of the spirit which actuated the future Protector. Cromwell was for taking the castle and the guns, the earl was for marching elsewhere, and upon this question the two men split, Cromwell thereafter taking his own independent line across the difficult country of politics which was before him. It matters not now to follow him through all his military achievements prior to the death of the king; suffice it to say that he was incessantly employed, retaining by stratagem his seat as a member of Parliament the while, and that he figured in all the great battles of the war, including Naseby, June 14, 1645, and was always attended by success.

Thoroughly persuaded of the dishonesty of the king; convinced that, unless he were completely overthrown, the last state of England would be worse than the first; persuaded also that there was not any man, or any set of men, on the Parliamentary side who could prevent this except himself, he determined, about the time King Charles was given up by the Scots, with whom he had taken refuge, to gather up the reins into his own hands, and to drive the chariot of the State along the only road which in his opinion was a safe one. Firmly, harshly, perseveringly, prayerfully, he addressed himself to his task, which was to overthrow the power—namely, the Parliament—which had overthrown the king, to subject the king utterly, even by death if need be, and to bring under obedience those rival chiefs and commanders, who, he foresaw, would never tolerate quietly the assumption of power by one whom they looked on as their equal or inferior.

It was by Cromwell's orders, or at least with his concurrence, that Cornet Joyce, with a strong party of cavalry, made a sort of raid on the captive king's guard at Holdenby, in Yorkshire, where he was on his way to be given up to the Parliament, and snatching the king from the hands of the Scots and the Parliamentary commissioners, brought him to the headquarters of the army. The army at that time was in open quarrel with the Parliament on the subject of the limitations which that body had thought fit to place upon the authority and influence of the military. The Parliament itself was divided into many factions, all pulling a different way, none of them seeking the general good, but only the advancement of their own petty interests. Cromwell, whose influence with the army was at this time paramount, resolved to crush the rival but divided power, and knowing the immense importance of the possession of the king's person, gladly acquiesced in, if he did not order, the violent taking of Charles from the custody of the Parliamentary commissioners.

Immediately he heard of the king's re-arrest he left London, hastened to the army, and putting himself at its head, marched to St. Albans, where he opened negotiations with the Parliament in London. The nation looked on approvingly, being disgusted with the way in which the Houses had used their power, with the taxes they levied, the harsh laws they enacted, and the tyrannical manner in which the executive was carried on; and though London held out in favour of the Parliament, the army marched up and demanded admittance, which was conceded to them without show of resistance. This was in June, 1647.

On November 11 in the same year, King Charles, who was a sort of prisoner at large at Hampton Court Palace, fled to the Isle of Wight, where he was detained at Carisbrook Castle by the governor, Colonel Hammond. Meantime the army, represented by Cromwell, had completely overawed the Parliament, which was allowed, however, still to exist till the dictator had used them for his purposes. The negotiations between it and the king having proved futile, Cromwell summoned a council of the principal officers of the army to devise some means of settling the nation. At this council it was resolved, after much prayer and much deliberation, to bring the king to trial for having committed treason against the people by levying war upon them.

Plots and counterplots now took place, some having in view the overthrow of the officers, some of the Parliament, some the restoration of the king, the result being that a second civil war broke out, aided by the Scots, and England was ablaze again from end to end. Promptly, skilfully, successfully, Cromwell and his friends crushed the rebellion and the invasion; and that being done, they resolved to bring the king to punishment for the part he had had in them. The Parliament resisting, the army came to London; and the Houses having still declared their willingness to treat with the king, and their entire disapproval of the course taken by the army, Cromwell resolved to coerce them still more, and on the 6th of December, 1648, "purged" the House by seizing some two hundred of the members inimical to his interests, and allowing no more than some sixty of the most partisan to remain. It was by a High Court of Justice appointed by this "Rump" Parliament that King Charles was brought to trial in Westminster Hall, and by a sentence of that court, signed, amongst others, by Oliver Cromwell, he was publicly executed "in the open space before Whitehall," on the 30th of January, 1648–9. There was no other way in the state to which things had come; it was war to the knife, and so wide had become the difference in political and religious feeling between the opposed parties that the intolerant absolutism of one of them was inevitable.

For four years after this event the government of England was nominally republican, and really a sort of Parliamentary executive under the control of the army. The prime mover, though he kept himself in the background, was Oliver Cromwell, whose will made itself law, and whose policy guided the State. Ireland, the state of which was more wretched and deplorable, perhaps, than at any other time in her history, was to be "tranquillised," and Cromwell marched through it in inexorable fashion, putting whole garrisons to the sword, burning, killing, and destroying, in pursuance of what his stern strong nature conceived to be the only efficacious way of dealing with her. Ireland was tranquil in the sleep of death, and never again was able to trouble the sister island with her aspirations after life. It was an awful opiate the Puritan leader gave her, and deadly and bitter was the hatred with which she awoke from the effects of it. With no worse malediction can an Irishman curse to-day than with "the curse of Crom'ell."

The Dutch were punished for the aid they gave to the king's cause by a naval war, which was singularly brilliant, and in which the names of De Ruyter, De Witt, Van Tromp, Blake, Ayscue, Venables, and Monk, shine out in bold relief. Scotland, which had espoused the cause of Charles II., and had proclaimed him king, was overrun by the same irresistible man who had crushed the opponents of the Commonwealth and Puritanism in Ireland. At Dunbar, at Stirling, and then at Worcester, whither the Scots' army had penetrated in order to be overthrown, the strong hand and wise head of Oliver Cromwell prevailed, and the royal cause was irretrievably lost.

In 1653 it became obvious to the army, or to the man who commanded it, that Parliamentary government must cease in form as well as in reality. The exceptional state of England rendered it impossible to have a divided government, and in divisions and petty squabbles only the Parliament, mutilated as it was, was strong. Every day the civil and the military powers were coming into collision. In the face of smouldering war at home, avowed hostility abroad, and the still unsettled state of the realm, this sort of thing would not do. Cromwell resolved to take the helm himself, and alone to steer the ship of the State. On the 20th of April, 1653, he dismissed the sham Parliament, over which Praise God Barebones presided, and was forthwith made Protector of the Commonwealth of England.

From that moment England rose to be a first-rate power in Europe. The Dutch were ruinously beaten in a two days' naval battle, in which Van Tromp, their great admiral, was killed. Spain, the greatest power in Europe, was victoriously withstood, and lost, among other possessions, the island of Jamaica; France, under Cardinal Mazarin, was glad to be well with the Republic of England; and Portugal received condign punishment for some assistance she gave to the exiled prince. At home a firm and disinterested rule served to heal many of the wounds from which poor England bled; and with a commerce protected afloat, and industry encouraged on shore, the English people grew prosperous, wealthy, and in some sort contented. Now and again the Royalists, and those enemies of theirs who were enemies of the Commonwealth also, gave the Government trouble; and it was seriously proposed, in order to put an end to their hopes, that Cromwell should make himself king, and found a new dynasty. In 1657 the crown was actually offered to him, but he firmly refused it, and accepted instead "the humble petition and advice," wherein were laid down rules for his guidance in the government, and in which his authority was defined.

For twelve months he continued to carry on his work, hoping against hope that it might be an abiding one; welding the disintegrated masses of English society into a strong united community; striving to do justice to all, though many would not suffer him; making the country he had been called upon to govern prosperous at home and respected abroad. Space fails to tell of all he did, or to seek out a knowledge of the intentions he was not allowed to fulfil. Regarded with respectful hatred by the Royalists, with envy by those whom he had outstripped in the race, with admiration by those who loved their country more than themselves, and prized the objects for which England had struggled and fought; loved by very few, unhappy in himself, Cromwell sank to rest; and enough has been said here to make it intelligible why to many of his countrymen a funeral and a tomb less than the most splendid seemed all unworthy of him, and also why, when Charles II. was restored to his father's throne, there were found men to suggest and approve the senseless barbarity which led to the exposure of his dead body on Tyburn gallows.

See:—Carlyle, *Cromwell's Letters and Speeches*; Masson, *Life of Milton*; Clarendon, *History of the Rebellion*; *Cassell's History of England.*

GEOLOGY.—III.

(Continued from p. 299.)

GLACIAL AGENCIES.

Frost.—Many of the ways in which ice has acted on the earth's surface, and is still acting, have been already described (*see* pp. 163–4). One of the most effective disintegrating agencies is undoubtedly that of frost. Water expands in freezing and thus exerts an enormous disruptive force upon rocks. Just as a gravel-walk rises up as if fermenting when the water in its interstices freezes, so the whole surface of fallow land, or indeed of any porous rock, is pulverised by the same agent, its removal by rain or wind being thus facilitated. So, too, large masses fall from our chalk cliffs when the thaw comes, having been detached by the freezing of water in fissures. If this disintegrating action may strictly be rather termed that of frost than that of ice after its formation, the actions of the latter will be seen to be rather erosive and transporting, the two actions being intimately combined. We may consider them under the heads of (i.) river-ice; (ii.) avalanches; (iii.) glaciers; (iv.) icebergs and sea-ice; and (v.) ice-sheets.

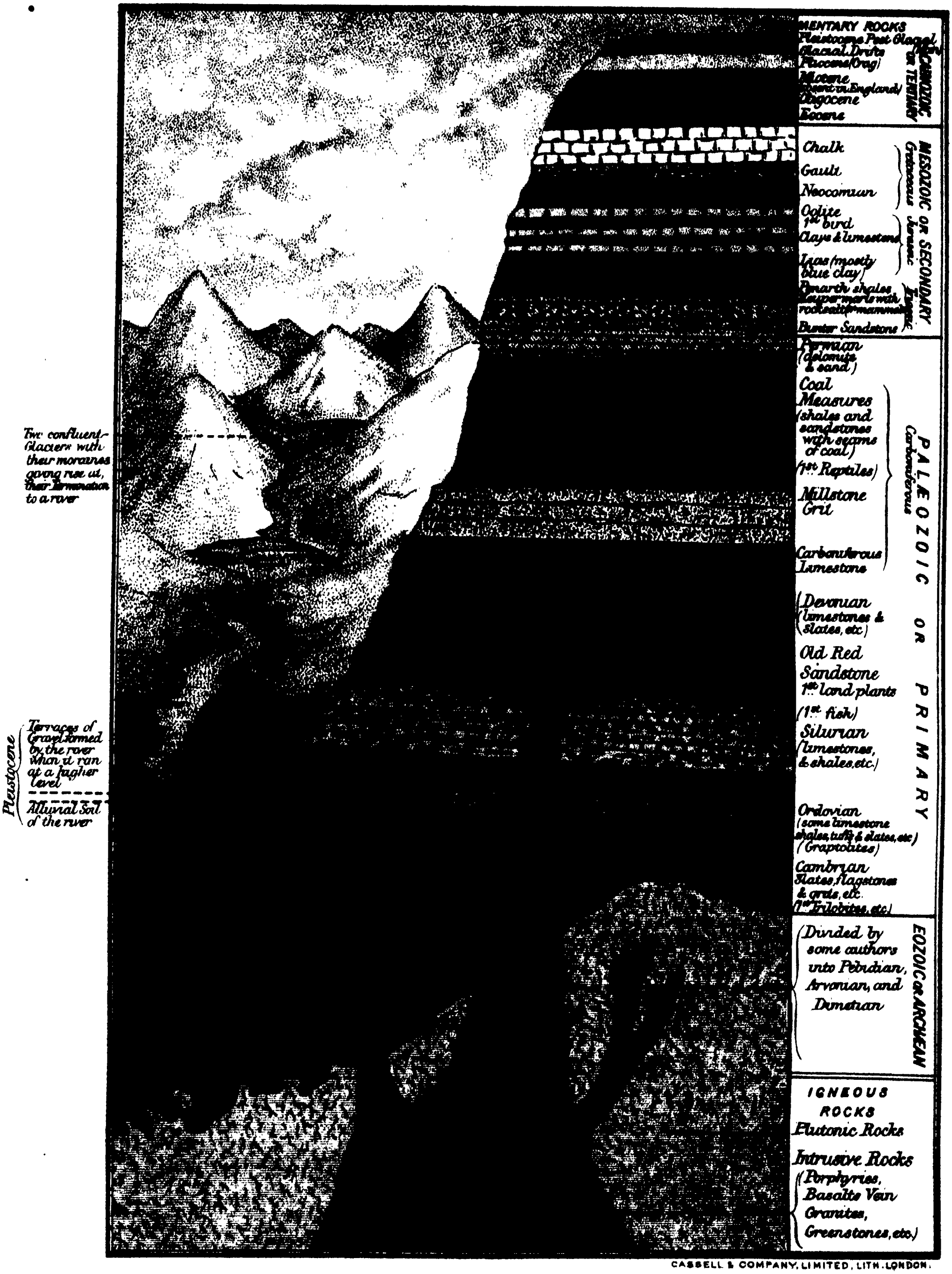
River-Ice.—In climates colder than our own, such as those of Canada and Siberia, the surface of running water is frozen every winter, often to a great thickness. When this ice breaks up in thaw it is carried down stream by the current in "rafts" which will often be driven ashore, especially where the river-banks curve or narrow, and may be heaped up and re-frozen to the soil only to be dislodged and to carry away stones and earth on their under surfaces. In such climates, indeed, when the thaw comes, the whole surface-soil of the sloping river-valleys seems to be sliding down to the water. Where a river in Arctic countries flows northward, as does the Petchora and many of the rivers of Siberia and Northern Canada, their mouths may often remain frozen while their upper waters are so no longer. This will cause the formation of a lake behind the ice-dam, flooding perhaps the wooded slopes bordering the river and perhaps, being stagnant, becoming frozen. The break-up of such a dam might cause a destructive flood, and the wide-spreading and thick accumulations of irregularly-bedded coarse gravel near the mouths of many of our river-valleys may be due to such action in a former colder period. When the Thames, in common with the other rivers of Eastern Britain, was a tributary of a Rhine which had its mouth to the east of the Shetland Isles, the ice of a Glacial winter may have blocked up the main stream and its tributary, even higher up stream than the mouth of the Lea, and have so given rise to such gravel-beds. Large masses of ice buried in gravel or mud, on melting, let down the overlying mass, and have thus undoubtedly produced some of the contortions observable in such alluvial deposits (Fig. 4).

It is not, however, only at the surface that river-water freezes. Where the river-bottom is uneven, or even in a similar case in shallow seas, such as the Baltic, the comparatively stagnant water in hollows in the bed may be sufficiently cooled by radiation, especially from large stones rolled into such hollows, as to freeze. The ice thus formed, floating to the surface, with stones or even anchors frozen into it, is known as *ground-ice* or *anchor-ice*. It is well known in the estuary of the St. Lawrence, and is even of importance in the Upper Thames. Stones may by it be floated in a day farther than they would be rolled along the river-bed in a twelvemonth.

Avalanches.—The avalanche does not play a very prominent part, seeing that the sphere of its action is very limited. When large masses of ice and snow collect on the inaccessible heights, and become either overbalanced by their own weight, or loosened by the warm sun of the spring, the mass falls into the valley beneath, bearing with it rocks, &c.; and the traveller, as he passes through the mountain valleys in Switzerland, often finds piles of débris which have been brought down by an avalanche from the heights above. This the valley stream carries down into the lake or river, and thus material from the summit of the chain mingles with the sediment which the stream erodes from the valley through which it passes. It occasionally happens that an avalanche in its fall dams up the channel of a stream; the pent-up waters gather in great volume, and at last burst their barrier, ploughing the valleys in their course, thus doing great geological work.

Glaciers.—In addition to what has been already said about *glaciers* it may here be pointed out that their former extension may often be traced by the main direction of their principal *striæ*, or scorings in the solid rock, and by identifying the rocks of which erratics are composed with those from which they have been detached. The Alpine glaciers, for instance, were once far thicker and longer; that of the Aar being once 4,000 feet thick at the Lake of Brienz and extending as far as Berne, 70 miles from its present termination, and that of the Rhone having carried the rocks of the Valais as far as Lyons, 170 miles farther than it now flows.

Not only do we find glacial striæ, roches moutonnées, and moraine accumulations in North Wales, the Lake District, and the Highlands of Scotland,


MENTARY ROCKS
Pleistocene Post Glacial
Glacial Drifts
Pliocene (Crag)
Miocene (absent in England)
Oligocene
Eocene
CAINOZOIC OR TERTIARY
Chalk
Gault
Neocomian
Cretaceous
Oolite
1st bird
Clays & limestone
Lias (mostly blue clay)
Jurassic
Penarth shales Keuper marls with rocksalt (1st mammals)
Bunter Sandstone
Triassic
MESOZOIC OR SECONDARY
Permian (dolomite & sand)
Coal Measures (shales and sandstones with seams of coal)
(1st Reptiles)
Millstone Grit
Carboniferous Limestone
Carboniferous
Devonian (limestones & slates, etc)
Old Red Sandstone 1st land plants
(1st fish)
Silurian (limestones, & shales, etc.)
Ordovian (some limestone shales, tuffs & slates, etc) (Graptolites)
Cambrian Slates, flagstones & grits, etc. (1st Trilobites, etc.)
PALÆOZOIC OR PRIMARY
(Divided by some authors into Pebidian, Arvonian, and Dimetian
EOZOIC or ARCHEAN
IGNEOUS ROCKS
Plutonic Rocks
Intrusive Rocks
(Porphyries, Basalts Vein Granites, Greenstones, etc.)
Two confluent Glaciers with their moraines giving rise at their termination to a river
Terraces of Gravel formed by the river when it ran at a higher level
Alluvial Soil of the river
Pleistocene

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A DIAGRAMMATIC SECTION SHOWING THE ORDER OF SUCCESSION OF THE VARIOUS ROCKS THAT COMPOSE THE CRUST OF THE EARTH WITH MORE ESPECIAL REFERENCE TO THOSE FOUND IN ENGLAND.

but where, as at Glen Roy, the lower end of a valley was once dammed up by a glacier so as to form a lake, we may find a series of beaches, the so-called "parallel roads," marking the successive stages in the melting of the ice-barrier.

Though it may be doubted whether a glacier has the same power of originating the valley down which it flows by its own erosive action as is possessed by a river, there can be little doubt as to its deepening its valley even in hard rocks. This may account for the great depth of many of the cañon-like lakes of districts either still or formerly glaciated, such as Loch Ness or the lakes of Switzerland and Northern Italy, many of which are deeper than the neighbouring seas. If, too, we allow for the possible previous "rotting" of the rocks, such as the conversion of the felspar into kaolin or china-clay, in hollows among the hills, we can well allow to glaciers the scooping-out of the tarns, or rock-surrounded lakes, we find in such situations. Besides these inland lakes, most of the fjords, sea-lochs, or firths to the north of the parallel of 40° N., show by their steep, striated, and moutonnéed rocky sides and deep channels that they are but the seaward extension of the valleys of former glaciers. The general parallelism of those of the west coasts of Norway, Scotland, and Ireland, all trending to the south-west, is noticeable as pointing to a general movement of ice seawards.

Icebergs and Sea-Ice.—Where glaciers reach sea-level their ice is pushed out into the sea, and vast masses of it, detached by the waves entering the crevasses, float away as icebergs. These masses of land-ice often carry considerable weights of moraine-matter. Whilst the icebergs coming from Greenland and other Arctic regions are commonly irregular in outline, the enormously thick *ice-cap* of the Antarctic Continent gives rise to regularly stratified tabular masses, much denser and darker blue in their lower than in their upper portions. Similar to the bergs thus formed from land-ice are those due to the freezing of the sea itself. Along the shores of Smith's Sound and other Arctic coasts ledges of ice, known as *ice-foot*, are formed, as along the banks of a river. These may be lifted up by tides until they project at some height above the water-level. They may contain beach materials frozen into their under surfaces and débris flaked by frost from the cliffs on their upper surfaces, and becoming detached, may float away as tabular bergs. Where the sea itself freezes over, away from the shore, it is known as *floe-ice*, and, though generally level, is sometimes heaped up very irregularly by wave and tide action, pockets of salt being in the same way intercepted between the layers of the ice which is otherwise fresh. In spring the floe breaks up into what is known as *ice-pack*, temporary passages, or *canals*, opening between the sheets, but frequently re-closing and so "nipping" vessels. Pack-ice or bergs may be drifted for many miles by ocean currents, and in narrow seas may be driven aground or even forced for some distance inland, carrying rock-débris with it and ploughing up the ground over which it passes. It would seem that in a former period ice has in this way been carried into the estuary of the Wash, checked by the high "wolds" of Lincolnshire and Norfolk and driven inland over the low-lying Fenland perhaps as far as Cambridge and Bedford. Stranded bergs melt and deposit the débris they carry, in beds often very thick and but little stratified. Such a deposit is the "Chalky Boulder-clay," full of rock-fragments and fossils from farther north, which we now find over a great part of Essex and Hertfordshire and in the triangular valley between Highgate, Muswell, and Mill Hills in Middlesex.

Ice-Sheets.—Evidence similar to that which proves the former local extension of glaciers goes to show that, at a period which is, geologically speaking, modern, the greater part of Northern Europe was buried under a continuous *ice-sheet*, similar to the far smaller ones now covering the Antarctic Continent and the interior of Greenland. A similar sheet extended over North America. The European sheet was probably over 6,000 feet thick above Scandinavia, 5,000 feet over the north-west of Scotland, and 1,500 feet over the Harz Mountains. Blocking the German Ocean with ice, it carried Norwegian boulders into our eastern counties, and the Baltic and Irish Seas seem to have been similarly blocked. The southern margin of the sheet seems to have passed from the neighbourhood of Nijni Novgorod and Kieff, across Galicia and Silesia, to the Riesen-Gebirge and Erz-Gebirge, the Harz, Hanover, Holland, the Thames, and the Bristol Channel. That of the American sheet is marked by a series of mounds or *kames* extending across the continent from the coast of Massachusetts for over 3,000 miles. Similar, but more local, mounds of gravel and sand, 20 or 30 feet high, often many miles in length and crossing hills and valleys alike, occur in Europe, and probably also represent the terminal moraine of a sheet of land-ice. They are known as *osar* or *eskars* in Scandinavia, *eskers* in Ireland, and *kames* in Scotland.

In part probably the "moraine profonde" of such a sheet of land-ice, and in part deposited in an iceberg-laden sea, are the deposits known as "till" in Scotland and as Boulder-clays and Glacial gravels in England. They contain boulders or stones, derived from various rocks, often of widely distant origin, and frequently ice-scratched, varying in size up to masses of many tons' weight, or possibly extending over acres. Though for the most part unstratified, the Boulder-clay is sometimes stratified, having apparently been then deposited in water.

MARINE ACTION.

The geological action of the sea, to which some allusion has been made already (*see* Vol. I., p. 267), is mainly two-fold, disintegrating and reconstructive. In disintegration its waters have some chemical effects, but these are apparently unimportant. Mechanically it acts (i.) by the force of its waves, *i.e.*, by the weight and velocity of the water; (ii.) by the force of the air compressed by them in clefts in the rocks forming the cliffs, or in sea-caves, or "blow-holes"; and (iii.) by the fusillade of shingle, sand, or other rock-fragments hurled against the cliffs. By the combined action of these forces masses many tons in weight have been literally quarried out of the face of cliffs in Shetland, even at 70 feet above sea-level; and, no doubt, sea-caves and blow-holes have been mainly formed in this way. That the compression of air is no inconsiderable factor in the work may be gathered from the estimate of the force of some waves as being 3 tons per square foot. The repeated violent concussion of the myriads of small stones, the battery by which is always compared to that of artillery, is, however, probably the most effective of the three agencies.

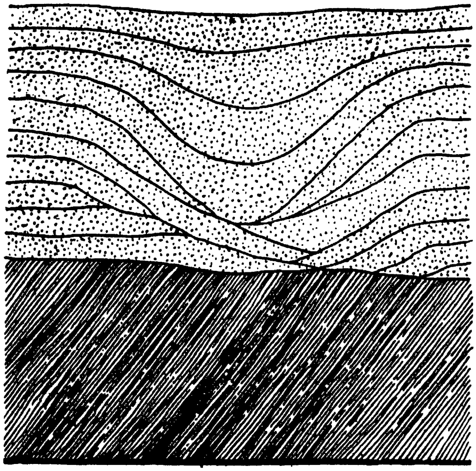

Fig. 4.—CONTORTIONS PRODUCED IN GRAVEL BY MELTING ICE.

As to its effects everyone who has stood on the sea-shore and watched the breakers roll in and dash themselves to spray against the cliffs must have felt that this wearing action of water on the coast must be considerable. On shores which are bounded by chalk cliffs the sea margin is rendered milky by particles of the chalk which the waves have separated from the rocks. Where the sea barrier is a hard and resisting rock, rock stacks frequently stand out of the water some distance from the shore, indicating the place to which the mainland formerly stretched. Examples of this are of frequent occurrence along the Scottish coast and the west coast of England. If the seaboard be of a soft species of deposit the action is of course much more rapid. Thus on the coast of Yorkshire, from Bridlington to Spurn, some thirty-six miles, where the coast consists of Boulder-clay, the waves erode 2¼ yards annually, so that the sea has encroached more than two miles since the time of the Romans. Many old maps of Yorkshire indicate that villages stood where now the waves hold undisputed possession, and ports mentioned in bygone history are no longer to be found. The same destruction is taking place on the coasts of Norfolk and Suffolk. The seaport towns are being driven back by the encroaching waters. The sites they occupied years ago now form their harbours. Between Cromer and Mundesley, according to the Ordnance Survey of 1838, the cliff has receded at the rate of fourteen feet a year. On the same coast, as in Yorkshire, many villages are only historical remembrances. The church tower of Eccles is still seen rising out of the sea-sand, but all other remnants of the village have long since succumbed to the action of the waves, or have been covered with the sand-hills which move along that coast. Dunwich, on the Suffolk coast, offers another remarkable instance of the destruction of the sea. What is now a small village was once a large and flourishing seaport; records of the town are preserved even in Domesday Book, from which we gather that the sea must have encroached on the land to the distance of several miles.

The same record of devastation may be written of all the south coast, and for a detailed description the reader is referred to chapter xx. of "Lyell's Principles of Geology," and to the local histories of towns which are built along these shores. All coast-lines are thus acted upon, the destructive operations being carried on with more or less activity, accordingly as the coast is low, the sea cliffs of soft material or of hard rock. We are not now considering the gains of the sea, or we might allude to the many terrible inundations which the histories of Holland and the adjacent low-lying countries chronicle, of vast tracts of land suddenly swept over by the sea, to the destruction of hundreds of villages, their inhabitants, and their cattle. It is true the persevering industry of the Dutch has raised dykes against their great enemy, and by enclosing many of the *meers* with such walls, and then pumping out their water, they have reclaimed from the devastator much of his prey. This is not our object. We only mention the action of the waves as they erode the shores they wash; the particles of matter they thus mix with their waters are swept away by currents, and in tranquil spots, or along the path of the current, the sediment reaches the bottom, and there forms a new deposit.

This destructive action is, however, confined to its coast-line. The deep sea is tranquil, wave-motion never probably reaching a depth of more than a hundred fathoms, and generally much less. Though breakers also may throw stones to a great height, and lofty cliffs may be undermined, it is their base only that is actually eroded; so that the lowest and highest limits of marine action are probably seldom more than 300 feet apart vertically. It is difficult to strike a general average between the rapid erosion of soft rocks and the sea's infinitesimal action upon some granitic cliff-lines; but 10 feet in a century, or a mile in 52,800 years, is perhaps an over-estimate. Marine denudation, though more striking, is thus many times slower in its action than the more wide-spread effect of sub-aërial agencies. An illustration of this is seen in such headlands as Shakespeare's Cliff, Dover, where the summit recedes more rapidly than the base.

Another contrast between the two classes of agents may be seen in the character of the surfaces which they produce. The sea, though skerries, pillars, and arches of hard rock may for a time resist its action, tends to wear everything down to a level, cutting *horizontally*, and forming below the region of wave-action a *plain of marine denudation.* When a sea-bed formed of rocks so planed down may happen to be raised above sea-level it will probably have a gentle seaward inclination; but its surface will not long remain a plain, for it will then come under sub-aërial influences. Sub-aërial denudation may be said to cut *vertically*, carving out hill and valley, as rivers wind and rocks vary in hardness. As Sir Andrew Ramsay showed in the case of the Ordovian hills of Cardiganshire, we may then have the plain of marine denudation represented by a series of hills whose summits lie approximately in a plane inclined seaward.

In leaving the subject of the disintegrating action of the sea we must not omit to mention its important work in constantly grinding down flints into shingle and quartzites and other rocks into sand. Flints falling from our chalk cliffs are often fractured by the action of varying temperatures, as they lie on the beach, into angular fragments. These are rolled into pebbles, which in their turn may be broken and further reduced in size. We see them to be covered with a mesh-work of curvilinear cracks produced by repeated collisions with their fellows; but as we hardly ever find any flint in the condition of sand—sand being practically always quartzose—Professor Judd suggests that flint is being constantly removed in solution by the action of sea-water along these cracks.

ENGLISH.—XII.

(Continued from p. 313.)

THE VERB. GENERAL PRINCIPLES *(continued)*.

THE PRESENT TENSE OF THE VERB "TO BE."

Person.	*Sing.*	*Plur.*
1.	I am	We are.
2.	Thou art.	You are.
3.	He is.	They are.

Here, including the infinitive *to be*, we have five separate forms for three which occur in the verb *to sleep*.

Usage, then, has led us to the acknowledgment of distinctive forms for the three persons of the *present* and the *past*. But having a complete present and a complete past tense, we are without a future. Is the English language without a separate form for future tense? By tense in grammar is meant a specific *form* corresponding to a specific *meaning* in relation to *time*. Thus, in Latin, amo is *I love;* but if we want to say *I will love*, we change am*o* into am*abo*. Does any such change take place in English? Unquestionably not; the form *love* of the present remains *love* in the future. The English language, then, has no separate form for *future tense*. Nevertheless, the English people can express a future act, and this they do by the employment of a second verb—namely, the verb *will* and the verb *shall*, as *I shall love, he will love.*

By means of other verbs, commonly called *auxiliaries*, we are able to express other varieties of meaning. These varieties, however, are so numerous, and in part so indeterminate and unfixed, as to defy the systematic arrangements of *tense* and *mood*. Here the very genius of the language seems to require that freedom from forms which is a marked feature in the character of those who employ it. The simple truth is, that the inflected forms of the regular verb in English are reducible to six—namely, *sleep, sleepest, sleeps, sleeping, slept, sleptest*. Whatever be the nature of these parts, certain is it that of only six inflected parts does the English verb ultimately consist. Etymologically, you find in it only *two tenses*, *one mood*, and *one voice*—no *future*, no *subjunctive*, no *passive*. Logically, other forms are possible. By combination you may make a passive voice, and subjunctive, potential, and optative moods. There is scarcely a mood or tense of the Greek verbs—to take a complex instance—which may not be expressed in English by the use of the proper auxiliary.

This adaptability gives to the English verb, in spite of its lack of inflections, extraordinary power of expressing the slightest *nuances* of mood and tense.

PERSON, NUMBER, TENSE, MOOD, VOICE, AND CONJUGATION.

Before proceeding farther with the verb it will be as well to explain more fully the terms which are used in connection with it.

The term *person* refers to the distinctions which exist among the speaker, the person or thing spoken to, and the person or thing spoken of. The speaker is the first person, the person or thing spoken to is accounted the second person, and the person or thing spoken of is accounted the third person.

There are, then, three persons, and these three are represented by the personal pronouns—*I*, or *we*, the first person; *thou*, *you*, or *ye*, the second person; and *he*, *she*, *it*, or *they*, the third person.

Number has reference to the number of persons or things indicated by the subject. If a noun denotes one object it is said to be in the "singular number"; if a noun denotes more than one it is said to be in the "plural number" (from the Latin plus, pluris, *more*).

Tense has reference to time. An action may now be going on; then it is said to be in the "present tense." Or an action may be over and gone; then the verb which describes it is in the "past tense." Or again, an action may be about to commence in some time to come; then the corresponding tense is called the "future tense."

Mood (from the Latin modus, *method* or *manner*) is a term which refers to the manner in which an action is set forth. Thus you may declare simply *he teaches*, when you indicate a fact without any qualification; this is called the "indicative mood" (Latin indico, *I point out*). Or you may say to a tutor, "Teach the boy": then you give a command; in this case the verb is said to be in the "imperative" (Latin impero, *I command*), or commanding mood. Another mood is called the "infinitive mood" (from the Latin in, *not*, and finis, *limit*)—that is, the indefinite mood, the form of the verb which is not bounded or qualified by person, number, or tense. Besides the *indicative*, the *imperative*, and the *infinitive*, commonly set forth in English grammar, the Latins had a subjunctive (or dependent) mood, and the Greeks had an optative (or wishing) mood.

The *voice* of the verb varies according as the action of the verb comes back on the subject or does not. If the action of the verb does not come back on the subject or actor the verb is said to be in the "active voice." If the action of the verb does come back on the subject or actor the verb is said to be in the "passive voice" (from Latin patior, *I suffer*, *I am the object of an action*).

Verbs are modified in *person*, *number*, *tense*, *mood*, and *voice*.

There are, then, three persons—the *first*, the *second*, and the *third*. There are two numbers, the *singular* and the *plural*. The persons and the numbers are indicated partly by inflections and partly by the personal pronouns.

Etymologically speaking there are only two tenses—the *present tense* and the *past tense*.

All other modifications of verbal meaning are expressed, not by varieties of form, but by the use of auxiliaries.

In these statements and definitions we have said nothing of *conjugation;* the reason is that the English verb has little which can with propriety be termed conjugation. Its varieties of tense and mood are principally indicated by means of auxiliary verbs; but as we have seen there is one change which the verb undergoes of the utmost importance, and that is the inflection which expresses the past tense. In some verbs the past tense is expressed, not by adding any letters to the present form, but by changing the vowel in the root syllable. These verbs are called Strong Verbs. And it should be remembered that these past tenses *once* all ended in *-en*; this syllable, however, has been dropped in modern English. In some verbs the past tense is expressed by the addition of *d* or *t*. These verbs are called Weak Verbs. Thus we have in English two main conjugations of verbs—STRONG and WEAK.

But although the verb in English is very poor, as far as forms are concerned, yet by the aid of auxiliary verbs it can express almost all shades of meaning possible. That you may clearly realise the capabilities of the verb in English, before proceeding to set before you lists of Strong and Weak Verbs we will give you a verb conjugated in all tenses and moods to serve as a model. But first there are one or two points which need explanation. The present and past tenses of the verb *to touch* are *I touch* and *I touched* respectively. But these tenses may be expressed in another form; thus, *I do touch* and *I did touch* respectively. These are called the emphatic present and the emphatic past respectively. There are three times in which an action may take place—*present, past,* or *future.* An action which has taken place at either of these times may be regarded as—(1) Indefinite, (2) imperfect or unfinished, (3) perfect, and (4) perfect continuous. And so we get twelve possible points of view from which the verb may be looked at, as far as tense is concerned. The following table will show you how these varieties of tense are represented in English:—

Tense.	*Indefinite.*	*Imperfect.*	*Perfect.*	*Perfect Continuous.*
Present.	I touch.	I am touching.	I have touched.	I have been touching.
Past.	I touched.	I was touching.	I had touched.	I had been touching.
Future.	I shall touch.	I shall be touching.	I shall have touched.	I shall have been touching.

You will notice that the English verb has an indefinite past, *I touched,* as well as a perfect, *I have touched.* In this respect it is richer than the Latin verb, and resembles the Greek, the indefinite past corresponding to the aorist, the perfect to the Greek perfect.

In the following passage you will find a large number of verbs, and it will afford you a useful exercise to write them down, with their inflected forms.

EXERCISE 11.

LETTER XL.

From James Howel, Esq., to his honoured friend, Sir S. C.

"SIR, "Holborn, 17th March, 1639.

"I was upon point of going abroad to steal a solitary walk when yours of the 12th current came to hand. The high researches and choice abstracted notions I found therein seemed to heighten my spirits, and make my fancy fitter for my intended retirement and meditation: add hereunto that the countenance of the weather invited me; for it was a still evening; it was also a clear open sky—not a speck or the least wrinkle appeared in the whole face of heaven—it was such a pure deep azure all the hemisphere over, that I wondered what was become of the three regions of the air with their meteors. So, having got into a close field, I cast my face upward, and fell to consider what a rare prerogative the optic virtue of the eye hath, much more the intuitive virtue in the thought—that the one in a moment can reach heaven, and the other go beyond it; therefore, sure that philosopher was but a kind of frantic fool that would have plucked out both his eyes, because they were a hindrance to his speculations.

"Moreover, I began to contemplate, as I was in this posture, the vast magnitude of the universe, and what proportion this poor globe of earth might bear with it; for if those numberless bodies which stick in the vast roof of heaven, though they appear to us but as spangles, be some of them thousands of times bigger than the earth—take the sea with it to boot, for they both make but one sphere—surely the astronomers had reason to term this sphere an indivisible point, and a thing of no dimension at all, being compared to the whole world. I fell then to think that at the second general destruction, it is no more for God Almighty to fire this earth than for us to blow up a small squib, or, rather, one small grain of gunpowder.

"As I was musing thus I spied a swarm of gnats waving up and down the air about me, which I knew to be a part of the universe as well as I; and methought it was a strange opinion of our Aristotle to hold that the least of those small insected ephemerans should be more noble than the sun, because it had a sensitive soul in it. I fell to think that in the same proportion which those animalillios bore with me in point of bigness, the same I held with those glorious spirits which are near the throne of the Almighty. What, then, should we think of the magnitude of the Creator Himself? Doubtless, it is beyond the reach of any human imagination to conceive it; in my private devotions I presume to compare Him to a great mountain of light, and my soul seems to discern some glorious form therein; but suddenly as she would fix her eyes upon the object, her sight is presently dazzled and disgregated with the refulgency and coruscations thereof.

"Walking a little farther, I espied a young boisterous bull breaking over hedge and ditch to a herd of kine in the next pasture; which made me think that if that fierce strong animal, with others of that kind, knew their own strength, they would never suffer man to be their master. Then looking upon them quietly grazing up and down, I fell to consider that the flesh which is daily dished upon our tables is but concocted grass, which is recarnified in our stomachs, and transmuted to another flesh. I fell also to think what advantage these innocent animals had of man, who as soon as nature cast them into the world find their meat dressed, the cloth laid, and the table covered. They find their drink brewed, and the butlery open, their beds made, and their clothes ready; and though man hath the faculty of reason to make him a compensation for the want of those advantages, yet this reason brings with it a thousand perturbations of mind and perplexities of spirit, griping cares and anguishes of thought, which those harmless silly creatures were exempted from. Going on I came to repose myself upon the trunk of a tree, and I fell to consider further what advantage that dull vegetable had of those feeding animals, as not to be so troublesome and beholden to nature, nor to be subject to starving, to diseases, to the inclemency of the weather, and to be far longer-lived. Then I spied a great stone, and sitting upon it, I fell to weigh in my thoughts that that stone was in a happier condition in some respects than either of those sensitive creatures or vegetables I saw before, in regard that that stone (which propagates by assimilation, as the philosophers say) needed neither grass nor hay, nor any aliment for restoration of nature, nor water to refresh its roots, nor the heat of the sun to attract the moisture upwards, to increase growth, as the other did. As I directed my pace homeward I spied a kite soaring high in the air, and gently gliding up and down the clear region so far above my head that I fell to envy the bird extremely, and repined at his happiness—that he should have a privilege to make a nearer approach to heaven than I.

"Excuse me that I trouble you thus with these rambling meditations; they are to correspond with you in some part for those accurate fancies of yours lately sent me. So I rest your entire and true servitor, . . ."

"Epistolæ Hoelianæ," by JAMES HOWEL.

On the next page you will find the active verb *to touch* conjugated in all its moods and tenses. This you may take as a specimen, and like it you may conjugate any other regular active verb in English.

INDICATIVE MOOD.

PRESENT.	IMPERFECT.
Sing.	*Sing.*
I touch *or* am touching.	I did touch *or* was touching.
Thou touchest *or* art touching.	Thou didst touch *or* wast touching.
He touches *or* is touching.	He did touch *or* was touching.
Plur.	*Plur.*
We touch *or* are touching.	We did touch *or* were touching
You touch *or* are touching.	You did touch *or* were touching.
They touch *or* are touching.	They did touch *or* were touching.

PAST INDEFINITE.	PERFECT.
Sing.	*Sing.*
I touched.	I have touched.
Thou touchedst.	Thou hast touched.
He touched.	He has touched.
Plur.	*Plur.*
We touched.	We have touched.
You touched.	You have touched.
They touched	They have touched.

PLUPERFECT.	FUTURE INDEFINITE.
Sing.	*Sing.*
I had touched.	I shall *or* will touch.
Thou hadst touched.	Thou shalt *or* wilt touch.
He had touched.	He shall *or* will touch.

FUTURE IMPERFECT.	FUTURE PERFECT.
Sing.	*Sing.*
I shall be touching.	I shall have touched.
Thou shalt *or* wilt be touching.	Thou shalt *or* wilt have touched.
He shall *or* will be touching.	He shall *or* will have touched.
Plur.	*Plur.*
We shall be touching.	We shall have touched.
You shall *or* will be touching.	You shall *or* will have touched.
They shall *or* will be touching.	They shall *or* will have touched.

The perfect continuous tenses are "I have been touching," "I had been touching," and "I shall have been touching." The student will be able to write these out *in extenso* for himself.

SUBJUNCTIVE MOOD.

PRESENT.	PAST INDEFINITE.
Sing.	*Sing.*
I touch *or* may touch.	I touched *or* might touch.
Thou touch *or* mayst touch.	Thou touched *or* mightest touch.
He touch *or* may touch.	He touched *or* might touch.
Plur.	*Plur.*
We touch *or* may touch.	We touched *or* might touch.
You touch *or* may touch.	You touched *or* might touch.
They touch *or* may touch.	They touched *or* might touch.

The imperfect subjunctive is, *I might be touching.*

The perfect subjunctive is, *I may have touched.*

The pluperfect subjunctive is, *I might have touched.*

These, however, it is unnecessary for us to give in full.

CONDITIONAL MOOD.

PRESENT.

Sing.	*Plur.*
I would *or* could touch.	We would *or* could touch.
Thou wouldst *or* couldst touch.	You would *or* could touch.
He would *or* could touch.	They would *or* could touch.

IMPERATIVE MOOD.

Sing.	*Plur.*
Touch.	Touch.
Let him touch.	Let them touch.

INFINITIVE MOOD.

PRESENT.	To touch.
PAST.	To have touched.
FUTURE.	To be about to touch.

PARTICIPLES.

PRESENT. Touching. PAST PASSIVE. Touched.

ANTHROPOLOGY.—IV.

[*Continued from p.* 321.]

THE MONGOLIAN RACE.

THE physical characteristics of Blumenbach's Mongolians were detailed in a former paper. Their faces are not like our own, oval, but broad and square. Their skulls are of the shape which Prichard calls pyramidal. The nose and the features generally are flatter than in most Europeans. The eyes are situated obliquely, and turn up at their outer extremity. The facial angle is not so high as among the civilised Western nations, but it exceeds that of the negro. The mouth does not greatly project. The hair is generally dark, as also are the eyes. The complexion varies according to the locality.

Blumenbach's Caucasians, it will be remembered, had to be separated into two great divisions, on the evidence afforded by language. It is almost certain that the Mongolians must be similarly treated, for there are great distinctions among the tongues which they speak. As a first step to understanding the matter, it is necessary to explain the fundamental principles on which languages have been classified. Readers comprehend what is meant by calling a word a root. The import is that it is a simple word, like *love*, *head*, *sun*,* which cannot apparently be resolved into any more primitive one from which it may be supposed to have sprung. Roots in language remind us of the simple substances in Nature, such as iron, silicon, or potassium, which chemists have not yet succeeded in proving to be made up of other substances. Professor Max Müller affirms that in all languages the roots are monosyllabic. He divides them into two classes: predicative roots—that is, those which assert something or other, as *eye*, *star*, *cold*; and demonstrative roots, meant to point something out, as *there*, *who*, *what*, *thus*, *that*, *thou*, *he*. It is believed that in every language the roots were at first separate from each other. No two had coalesced, but all stood out in absolute isolation. The Chinese is notably in this predicament still. "It is a language," says Professor Max Müller in his "Lectures on the Science of Language," "in which no coalescence of roots has taken place; every word is a root, and every root is a word. It is, in fact, the most primitive stage in which we can imagine human language to have existed." Language in this "radical stage," that is, this root stage, he calls *monosyllabic* or *isolating*. Many languages have, however, gone beyond the radical, and reached the *terminational stage*. In their case two or more roots have coalesced to form a word. Of these, however, one has invariably lost its original independence, and sunk into a mere termination. In the English term "breastwork," there are the two roots, *breast* and *work*, not, as in Chinese, standing apart from each other, but one (*work*) figuring as the termination of the other (*breast*). This kind of union is called *agglutinative*, from the Latin word gluten, *glue*, as if two separate roots were glued together. With the exception of the Aryan, the Semitic, and the Chinese, with its cognate dialects, all the languages of Asia belong to the agglutinative division. The next and highest stage of all—the "inflectional" is that in which the two roots in conjunction have thoroughly coalesced, both having lost their substantive independence, so that they cannot now be easily dissevered. In the English word *is*, for instance, there must be two roots, the one (predicative) asserting the existence of a person or thing; and the second (demonstrative) indicating that the entity pointed at is not in the first or the second, but in the third person. Languages of this character are called *organic*, or *amalgamating*. Those which answer to the description now given are the forms of speech used by the Aryan and Semitic races.

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* It was needful for clearness that we should give some specimens of roots; but we would carefully abstain from asserting that those actually selected may not yet be curtailed or otherwise simplified by future analysis.

To confine our attention now to the Mongolians. Language cannot render us so much service here as it did in the case of the inflectional class, in which similarity of inflection, it will be remembered, was deemed a better proof than resemblance in roots that tongues now distinct had formerly been identical. But in most of the Asiatic languages there are no proper inflections, and it is an extremely vague character to say that some Mongolian nations speak monosyllabic and other agglutinate languages. How many families like the Aryan and Semitic Caucasians will ultimately be made out of the vast Mongolian chaos it were difficult at present to say. We should suppose several, especially if the Americans and the Malays of Blumenbach are regarded as simply more or less modified Mongolians. All that can at present be done, however, is to follow existent lights, and separate the Asiatics belonging to the comprehensive division of mankind now under review into two sections, those speaking monosyllabic and those using agglutinate tongues.

The Chinese, as already stated, stand as the most typical specimens of the first division. Thus, where in Latin the expression would be used, *baculo*, "with a stick," the Chinese say *y cang*, meaning "employ stick." The physical appearance of this interesting people is well known, though some pictures exaggerate rather than correctly represent its peculiarities. The Chinese have the Mongolian eye more manifest in them than in the tribes and nations around, that is, they have eyes linear in form and situated obliquely, so that the outer extremity is turned up. The beard is scanty.

We pass next to the remaining divisions of the Mongolian race. After Professor Max Müller has disposed of the Chinese and its cognate dialects he divides all the other languages spoken by Mongolians, at least of the eastern hemisphere, into two great sections—the northern and the southern divisions of the great Turanian family of tongues. Ages have elapsed since the name *Turan* was first opposed to *Arya*, or rather *Aria*, the former being used to designate the wandering Mongols, while the latter stood for the more settled Brahmans and Iranians, who were believed to be of superior race. All the languages now mentioned are held by Müller to be agglutinate, though some of them, such as the Thibetan, the Karen, the tongues of Siam, Laos, and Cambodia, are transferred by Farrar, as indeed had been done by Latham and others previously, to the monosyllabic class. To turn now to the Northern Turanians.

The North Turanian forms of speech are five in number—the Tungusic, the Mongolic, the Turkic, the Samoyedic, and the Finnic (Uralic) tongues. An interest attaches to each of the five. From the Tungusic branch of the Turanians came the Manchu Tartars, who in the seventeenth century conquered China, and still retain supreme authority in that great land. The Taiping revolt was a rise in arms of the native Chinese against their Tartar rulers. It was nominally the Mongolians proper, though really a medley of Turanian tribes, among whom, however, the Mongolians were the most prominent, who under Ghengis Khan conquered a great part of Asia, while his successors carried their arms into Europe itself. Most are familiar with the title "the Great Mogul," as applied to the Delhi emperors, and one section of the Indian Mahometans are still called Moguls; but the Turks were really more prominent than the proper Mongols in that conquest of India which led to the establishment of the Delhi-Mogul throne.

The Turks follow next in order. They are associated in most minds simply with the Sultan and his dominions, but in reality they are widely spread throughout all Western and Central Asia. So much is this the case that Russian Tartary is now called Turkestan, and even Chinese Tartary, Chinese Turkestan. *Stan*, or *sthan*, is a Persian word, meaning "place," as Affghani*stan*, "the place of the Affghans," Hindo*stan*, "the place of the Hindoos." Turke*stan*, then, is the place or the country of the Turks. The Mongolian physical characteristics have become greatly softened down in the case of the Turks resident in Europe. Intermarriages with Circassian and Greek Aryans have had much to do with this. Besides, as Prichard shows, a nomad race settling down in a fixed habitation, and becoming more civilised, so alters that the square face and the pyramidal skull of the old pastoral Turks would almost of necessity be modified for the better, even without Aryan intermarriages, by their advance in civilisation.

The Samoyedes follow next in order. They are a polar race akin to the Esquimaux. They occupy a vast tract of land in the north of Europe and Asia, extending along the shores of the Arctic Ocean, from Archangel on the White Sea to Cape Tchelitskin and Khatanga Bay. This conducts us once more to European ground, and here the Finnic subdivision of the Northern Turanians brings up the rear. The Finns and the Laplanders belong to the group. So do the Magyars of Hungary. The affinity of the Finns and the Magyars is thoroughly proved by the similarity in their respective languages. The Magyars have been in Europe for only about 1,000 years. They entered it as conquerors in the ninth century, and seized on the territory which they at present occupy. Possibly many of the same race may have been in that part of Europe previously, descended from the wild Huns, with whom Attila had scourged the nations centuries before.

Unlike the Magyars, whom we have seen to be recent invaders from Asia, the Finns are perhaps the oldest inhabitants of Europe. It is suspected that they once overspread a great part of our continent, though so little of it remains to them now. The Laplanders are of Finnish descent. The Basques in the south of France and the north of Spain were once held to be Celts, but this view has long been abandoned. The truth seems to be that when the Aryans came to Europe they found there two great aboriginal races—one with skulls longer than they were broad (*dolichocephalic*) inhabiting Provence, the other with skulls remarkable not for length but breadth (*brachycephalic*) inhabiting Scandinavia. The Basques are a dolichocephalic and the Finns are a brachycephalic people. They are the only Europeans whose language has no affinity to Sanscrit, and they, therefore, most likely represent the last relics of the original inhabitants of Europe, who were submerged under the tide of Aryan invasion.

The language of the Basques has some affinity, not in its roots, but in its polysyllabic character, to the North American tongues.

The South Turanian family of speech resolves itself into four divisions—the Tamulic, in the south of India; the Bhotâya, or the dialects of Thibet and Bhotan; the Taic, or those of Siam; and the Malayic of the Malay Peninsula, the Eastern Archipelago, and the Pacific Islands.

As before mentioned, the great mass of the Hindoos are not Aryan, but Turanian. The languages of the south of India — the Tamil, the Teloogoo, the Canarese, the Malayalam, and others unequivocally show this. Though it be less easy to prove the point, yet it is believed to be the same with the tongues of Central and of Northern India, albeit their original character has been entirely disguised by the great infusion into them of Sanscrit words. Thus, in the Mahratta spoken in Central India, one-fifth of the words are not of Sanscrit origin. In the Hindi of India north of the Nerbudda, where Brahmanism has more or less flourished during the last 2,000 years and more, one-tenth of the words are derived from some language different from the Sanscrit.

The only other group of South Turanian languages that we shall notice is the Malay, that spoken by the race so named in Blumenbach's arrangement, and by him regarded as one of the primary varieties of mankind. For its physical characteristics we would refer our readers to a former paper. A very interesting point connected with it is that, as the evidence of language shows, it is not confined to the Malay Peninsula or Archipelago, but is spread from Madagascar on the one side all through the Pacific Islands to the expanse of water severing these from the coast of America. Among many other tribes it includes the New Zealand Maoris.

THE AMERICAN RACE.

Archæologists have proved that the American continent must have been inhabited from a more remote period of antiquity than was once believed; and probably it was by the ancestors of the Red Indians (Fig. 2), now so extensively diffused over the New World. Though called *Indians*, of course they have no clearly traceable affinity to Brahman

Aryans, or even to the low caste Turanians of Hindostan. It is no misnomer to term them *red*, for that is their prevailing colour. At the same time it must be remembered that various other hues occur among them, from the white seen in some tribes occupying cold mountain regions to the black which characterises those dwelling in the hot and arid parts of California.

The aboriginal inhabitants of the American continent resolve themselves into two divisions—the Esquimaux and the Americans proper. The Esquimaux inhabit Labrador, Greenland, and other parts of North America either bordering on or actually extending within the Arctic circle. Nay, more, they are found on the Asiatic as well as the American side of Behring Strait. The name Esquimaux is said to be a native Indian one, signifying "eaters of raw fish." The people so designated are in physical appearance like the Asiatic Mongolians. They have small eyes; their noses but slightly project; their faces are broad and flat, with the cheekbones high; their hair is long, coarse in texture, and black in colour; they have naturally scanty beards, and make them yet more so by rooting the hairs out. In language they decidedly approach the American Red men, and not the Asiatic Mongols. It is, therefore, less easy than it otherwise would be to answer the question whether the original seat of the Esquimaux was Asia or America. If bodily conformation be allowed to decide, then the response will be Asia; if, on the contrary, language be made the determining consideration, the reply will be America. But it might be added that, though the Eastern Esquimaux differ physically from the Indian tribes who are their neighbours, the Western Esquimaux show no such contrasts. The Esquimaux of Alaska gradually pass into the Indians of the Western Pacific slope.

If the Esquimaux be omitted, then the other natives of the Transatlantic continent are of one physical type. Morton, the founder of the American school of ethnology, says:—"All possess alike the long lank black hair, the brown or cinnamon-coloured skin, the heavy brow, the dull and sleepy eye, the full and compressed lips, and the salient but dilated nose. The forehead is lower than in any other race of men, but in some instances this is compensated by its breadth; the eyes are deeply sunk in the head; the nose, though not quite aquiline, yet so far tends to that type as to be decidedly arched."

The Negroes and other African Races.

It is convenient for ethnological purposes to suppose Africa divided into two great regions—the first comprising the Barbary States, Egypt, Nubia, and Abyssinia; and the second the whole remaining portion of the continent. In the middle and lower part of the valley watered by the Nile, as well as in the wide expanse of territory lying between the Mediterranean and the Sahara, the physical aspect of the dominant races, and indeed of the inhabitants generally, is more or less unequivocally Caucasian, while in other parts of Africa the type of structure met with is predominantly negro.

It is difficult to classify the first-mentioned group of nations. Time was when the Coptic or Egyptian language was held to be Semitic, and placed side by side with the Arabic. The Amazirgh or Berber tongue, spoken in many parts of Barbary, was thought to have a similar affinity. Now, however, it appears that though there are many Semitic words in both Coptic and Berber, yet the great majority of the roots in these languages are un-Semitic. What then are they? This is a question difficult to answer. Possibly further research may show that both Coptic and Berber have certain affinities to the tongues south and west of them. The negro would thus claim affinity with the Egyptians, to whom even the Greeks looked up with respect, and whose ancient monuments have afforded information, nowhere else obtainable, with regard to the early history of mankind. If the Egyptians were really of the race which, in the low, hot, steaming districts of tropical Africa, developed the physical peculiarities of the negro, then they must have become greatly modified for the better, both physically and intellectually, during the lapse of years. Two causes might have operated to produce this result. Resident as the Egyptians were in the immediate vicinity of the Syro-Arabian nations, they—or at least the upper classes among them—intermarrying with the superior race, would in time approach its level, just as the Turanian tribes have done in Europe. Moreover, their situation at the junction of three great continents must have tended to their civilisation; and this, again, may have acted favourably on their physical and mental organisation. The supposition that the upper classes in the valley of the Nile were more or less Caucasian, while the lower ones were somewhat akin to negroes, would reconcile contradictory evidence with regard to the ethnology of ancient Egypt. Thus, on finding Herodotus describe the Egyptians very much as if they were a negro race, it would quite vindicate his accuracy were we to simply say that he referred to the mass of the people; while the Caucasian character of the mummies which have been opened, as well as that of the Egyptians represented on the monuments, would be at once accounted for by remembering that people who had been expensively embalmed, or who had been deemed worthy of being immortalised by means of painting or sculpture, would almost certainly be of aristocratic rank, and therefore pre-eminently Caucasian.

It should be mentioned that Bunsen considers the Egyptian language to have affinities both with the Indo-European and Semitic tongues, which he explains by supposing that the Egyptians separated from the primeval stock of mankind whilst the Aryans and the Semites were yet but one people.

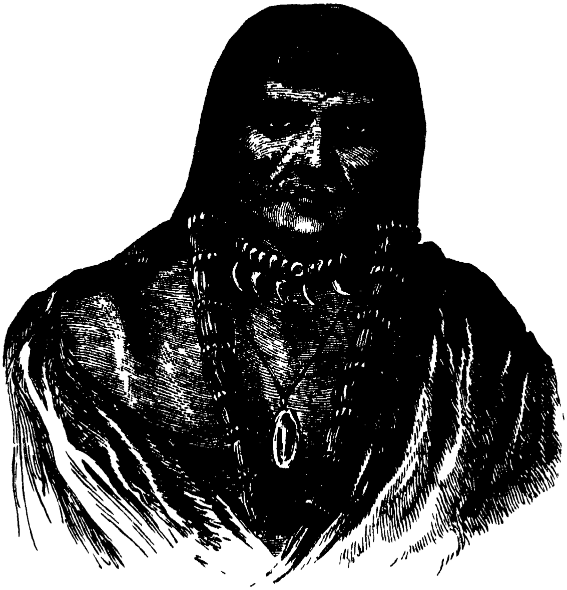


Fig. 2.—Sioux Indian.

The language of Nubia is sometimes called Barabra, or Berberine, which must not be confounded with the Berber or Amazirgh of the Barbary States. The Nubians are intermediate in physical character between the Caucasians and the Negroes.

Abyssinia is a very interesting region, ethnologically viewed. There are in it undoubted Semitic tribes, and others more distinctively African. The country consists of three great table-lands rising one above another. On the second of these, that of Tigré, long stood the old city of Axum, which was the capital of a Semitic kingdom. Other races exist in Abyssinia which we cannot notice in this brief sketch; we proceed, therefore, at once to the Amharic tribe, that now dominant in Abyssinia. The Amharic language is believed to be not a Semitic, but a properly African tongue. It chiefly prevails on the third or most elevated platform, the one to which our troops ascended to attack Magdala. Abyssinia is the last Caucasian or semi-Caucasian outpost in Africa; all beyond is negro; and, indeed, the outpost itself has for some considerable time back been more and more invaded by the Galla tribe, which is purely an African race.

We come now to the Negroes, or at least to the nations of Central Africa who have been so designated. Negro is properly an Italian and Spanish word, originally taken from the Latin *niger*, black. It is not the case, however, that all Central African negroes are of the same hue. In tropical countries the climate of low-lying tracts along river-banks and that of more elevated regions greatly differs, and it is only in the former that the negro attains to that intense blackness which is often held to be a constant characteristic of his race. His uncouth features also are somewhat modified for the better on the more elevated table-lands; and finally, in favoured localities he reaches a certain measure of civilisation.

The tribes south of the Tropic of Capricorn are not of the proper negro race. They may be divided into Kaffirs and Hottentots. The former are so superior a race that temptation has arisen to hold without proof that they must have a large infusion of Arab blood in their veins, but their physical appearance shows them to be almost wholly African. Yet those who have had to do with them speak highly of their intellect. The name Kaffir is a Mohammedan one, signifying that the individual or tribe so designated is "infidel." The proper name of the Kaffirs is Amakosas, the first two syllables of which are the same as those of the term Amazirghs, applied, it will be remembered, to the Berbers of Northern Africa.

The Hottentots, though occupying territories adjacent to those of the Kaffirs, are a totally distinct and nomadic people—indeed their yellowness of colour gives them a Mongolian appearance. Their most curious physical peculiarity is the development of fat on the posterior portion of the female body, which, when clothed, must serve them as a "bustle" or dress-improver serves their European sisters. They have never shown themselves able to hold their own like the Amakosas; and, unless when raised by missionary exertions, they have simply sunk lower and lower as civilisation has advanced. They represent the aboriginal inhabitants who have been driven from South Africa by Kaffir invaders. The Bushmen are most probably degenerated Hottentots, being mostly stunted in stature, deformed in appearance, and despised even by the other native Africans around. Unlike the Hottentots they are not susceptible to the influences of European civilisation, and the attempt to Christianise them has been a failure.

THE NEGRITOS AND NATIVE AUSTRALIANS.

This name has been applied to a race which, though negro in its characteristics, yet occupies regions so remote from Africa that it is not easy to suppose it in any way connected with that continent. It inhabits the Eastern Archipelago, being found in Borneo, the Philippine Islands, the Moluccas, New Guinea, and portions of Polynesia. Among the most remarkable specimens of the family are the Papuas of New Guinea, who have immense mops of frizzled hair, which give them a very odd appearance. Some have thought them not a pure, but a mixed race.

The aboriginal Australians are readily distinguished from the Negritos by their hair, which is not short and woolly, but long and curly. Nevertheless, they occupy a very low place in the intellectual scale. The most persevering missionary effort among them has effected but little, and the race hastens to extinction.

CONCLUSION.—Among all the plants and animals of the world a struggle for existence is continually in progress, and the same is the case with the several races of men. When civilisation and barbarism come in contact, the option which natural law gives to the less advanced race is a very stern one: it must accept civilisation, or rather the rule of the civilised race, or perish. Barbarism may, however, impose its dominion on civilisation where the civilised race is morally and physically effete.

Though mourning the human guilt which has so often been shown in the treatment of the inferior by the superior races, we must still admire the wisdom and the goodness displayed in the natural law which makes that struggle for existence, so plainly discernible among the plants and animals of the world, operative also in the case of our species. Its tendency is slowly, and, where man does not criminally intervene, almost painlessly to extinguish tribes, low in understanding and morality, and unlikely to rise to the level at which they might be able markedly to benefit humanity. While these are passing away, their places are being rapidly taken by races of better organisation and higher mental and moral development. The ultimate effect produced by the perpetual elimination of whatever is less perfect must be to raise the general level of humanity, and conduct it ultimately to heights which, but for this unceasing and dire struggle for existence, it would for ever be forbidden to reach.

BOOK-KEEPING.—IV.

[Continued from p. 811.]

CAPITAL ACCOUNTS.

THE records of any business are the records of the business itself as contra-distinguished from the affairs of the proprietor personally, and debiting and crediting is determined from the point of view of the business, and not from the point of view of the proprietor in his personal or private capacity. The latter is treated in book-keeping as an outsider; and, like any other person having dealings with the concern, is credited with what he transfers to the business and debited with what he receives from it. The proprietor in his personal capacity, and the proprietor as the representative of his own business, are in book-keeping regarded as two distinct persons—*i.e.*, as persons trading with one another, owing one another money, and subsequently discharging one to another the debts that have been incurred.

We now give transactions in dealing with which the construction of capital accounts will be exemplified. It will be seen in the course of the illustrations that capital accounts are simply personal accounts, the person being the proprietor of the business, or one of the proprietors; and it will also be seen that they follow the same rule of debit and credit as all other personal accounts.

On the 1st of January, 1889, W$^{\text{m}}$· Wykeham commences or recommences business with the following assets, viz.:—

Cash at Bank - - - - - - - -				£230	2	6
Book debt, owing by Thos. Heath - -				55	17	6
Bills receivable current - - - - - -				714	0	0
Freehold warehouse - - - - - -				2,000	0	0
Cotton, valued at - - - - - - -				1,500	0	0
				£4,500	0	0

against which exist the following liabilities, viz.:—

Sum borrowed of George Stewart, secured by mortgage of the above-mentioned premises -	£1,200	0	0			
Bill payable current - -	800	0	0			
				2,000	0	0
Leaving as net amount of capital -				£2,500	0	0

This £2,500 represents the net value of the property with which the business is opened or reopened. It is generally spoken of as Capital, and the account of the proprietor of the business, or the accounts of the part-proprietors or partners in a partnership, or the accounts of shareholders in a joint-stock company, are called Capital accounts.

The debits and credits recorded in the books previously kept by Wykeham are transferred to the books of the new or renewed business. The debit of £230 : 2 : 6 in Wykeham's books to Bank Cash becomes a debit in the business account for Bank Cash. The debit to Thomas Heath in Wykeham's books becomes a debit to Thomas Heath in the books of the business. Similarly the debit to Bills Receivable, the debit to Freehold Warehouse, and the debit to Cotton, all of which appear in his books, become debits to Bills Receivable, Freehold Premises, and Cotton respectively in the books of the business. On the other hand, the credit to Mortgage and the credit to Bills Payable appearing in his books, become credits to Mortgage and Bills Payable respectively in the books of the business. The difference in amount between these assets and liabilities is the amount of his capital, the net amount of sundry property (assets less liabilities) transferred by him to the business, and with this amount the account for his capital in the books of the business is therefore credited.

On the same day W$^{m.}$ Wykeham admits Martin Martin into partnership. Martin's assets are as follows :—

Cash in hand, or Office Cash	£20	10	6
Book debt owing by W^m Howard	250	0	0
Leasehold Offices, value of lease	1,000	0	0
(An annual rent of £100 is payable under this lease.)			
Cotton valued at	2,059	9	6
	£3,330	0	0

His liabilities are as follows :—

Loan at 5 per cent., repayable to Charles Sumner	£750	0	0			
Half year's rent of lease	50	0	0			
Clerk's salary outstanding	30	0	0			
				830	0	0
Leaving as net capital				£2,500	0	0

As in Wykeham's case, so in Martin's, the assets are recorded by debit entries to their various accounts, and the liabilities by credit entries. We shall therefore debit Office Cash, debit W^m Howard, debit Lease of Offices, and debit Cotton; we shall also credit Chas. Sumner (Loan account) with the amount of his loan; and for the other liabilities, which are small and unimportant, we propose to cut the book-keeping short by opening one account to be called Sundry Creditors, instead of separate accounts for each. Finally, we have to credit Martin Martin (Capital account) with £2,500, the net value or amount of his capital.

We have proposed to place the sums outstanding for Rent and Clerk's salary to one account, to be called the account for "Sundry creditors." A collective account is frequently kept in place of a number of separate accounts when the items are comparatively small, or whenever, for other reasons, it is not deemed advisable to establish separate accounts in the chief books of the business. Of course, the separate accounts must be kept, in a more or less formal manner, somewhere ; but such a record may be a simple list showing the names and amounts only.

Jan^y 2.—Sold Cotton to the Liver Cotton Co^y and received a bill for the amount . £1,200 : – : –

Debit the Liver Co$^{y.}$ and credit Cotton with the cotton transferred to the Co^y, and debit Bills Receivable, and credit the Company with the bill given by the Company in payment. The account for the Company, with its equal debit and credit entries, may be omitted altogether, but in the case of large transactions we do not recommend this course.

Jan^y 3.—W^m Wykeham withdrew by cheque from his capital, for private purposes . £100 : – : –

Debit Wykeham and credit Bank Cash. Wykeham's Capital account might be debited, but if the withdrawal is of a merely temporary nature, as is usually the case, a separate account, called a Current account, is frequently employed. The Capital account is thus left unencumbered with temporary changes in the capital of the partners.

Jan$^{y.}$ 4.—Consigned to Bell & Co., of Dublin, a quantity of cotton to be sold by them on our account and at our risk . . £608 : – : –

Here the cotton—*i.e.*, the ownership—is not really transferred to Bell & Co., but remains at present the property of the business, and is only sent to them to sell it, if they can, and to remit the proceeds. We do not therefore debit Bell & Co., but merely open another property account for cotton placed under new conditions. Debit a special account for cotton, entitled "Consignment to Dublin," and credit the ordinary Cotton account.

Jan^y 5.—Discounted at the Bank of England bill receivable for . . . . £714 : – : –
The bank charging as discount . . £3 : 2 : 6
And placing to the credit of the business banking account . . . £710 : 17 : 6

The business receives (i.) cash, and (ii.) the use of cash, and gives up the bill. Debit Bank Cash with £710 : 17 : 6, and Interest and Discount with £3 : 2 : 6, and credit Bills Receivable with £714.

Jany. 7.—Thos. Heath complains that the goods delivered to him by Wykeham are not up to sample, and, after due examination, it is agreed to accept his cheque for £45 : 17 : 6.

His cheque for £45 : 17 : 6 is accepted in full discharge of his debt, and paid into the bank, and the £10 is charged to Wykeham personally. Debit Bank and credit Heath with £45 : 17 : 6; also debit Wykeham's (current) account and credit Heath's with £10. The Current account of Wykeham, and not his Capital account, is debited, because the loss incurred is in this case to be made good at once, and Wykeham's capital to be kept at the full amount of £2,500.

Jany. 8.—Received cheque from Bell & Co., being advance on the security of the Consignment of Cotton . . . . . £400 : – : –

Here we will not credit the Consignment account, for the consignment is not yet sold. At present the amount of the advance is owing to Bell & Co., and would have to be repaid if the goods were not ultimately sold. Debit Bank Cash and credit Bell & Co.

Jany. 9.—Wykeham gives a cheque in payment of the loss on Heath's debt . . £10 : – : –

Debit Bank Cash and credit Wykeham's (current) account.

Jany. 10.—Bought a freehold building adjacent to the present warehouse, and paid by cheque £500 : – : –

The additional property is acquired as an enlargement of the business premises. Debit Freehold Warehouse account and credit Bank Cash.

Jany. 11.—Sold cotton to Thomas Heath, on credit . . . . £750 : – : –

Debit Thos. Heath and credit Cotton.

Jany. 12.—Received a consignment of cotton from White & Co., to be sold on their account and at their risk, invoiced at . . £670 : – : –

Here there is no actual transfer, the cotton until sold remaining the property of White & Co. The receipt of the cotton would be duly recorded in the warehouse books, but no entry is required in the financial books of the business. The invoice price is a guide in fixing the selling price.

Jany. 14.—Discounted at the Bank of England bill receivable for . . . £1,200 : – : –
The bank charging as discount . . £3 : – : –
And placing to the credit of the business banking account . . . £1,197 : – : –

Debit Bank Cash with £1,197, and Interest and Discount with £3, and credit £1,200 to the Bills Receivable account.

Jany. 15.—Allowed Thomas Heath by way of trade discount, in consideration of his paying cash £7 : 10 : –
And received his cheque for . £742 : 10 : –

Debit Trade Discounts and credit Heath with £7 : 10 : –; also debit Bank and credit Heath with £742 : 10 : –.

Jany. 16.—Martin Martin withdrew a portion of his capital for private purposes £500 : – : –

Assuming the withdrawal to be of a permanent character, debit Martin's (capital) account and credit Bank Cash.

Jany. 17.—Wm. Wykeham replaced the amount temporarily withdrawn from his capital £100 : – : –

Debit Bank Cash and credit Wykeham's (current) account.

Jany. 18.—Paid out of office cash certain expenses in connection with White & Co.'s consignment £5 : 10 : –

Debit White & Co's consignment (*i.e.*, really, White & Co.) and credit Office Cash.

Jany. 19.—Discounted bill payable (i.e., *a bill payable by the business*), *deducting discount* £3 : 6 : 8
And gave a cheque for . . £796 : 13 : 4

Here the business receives back its own bill before it falls due for payment, and cancels it, and gives up cash and the use of cash. Debit Bills Payable account with £800, credit Bank Cash with £796 : 13 : 4, and Interest and Discount with £3 : 6 : 8.

Jany. 21.—Sold a portion of White & Co.'s consignment, and received cheque for £450 : – : –

Debit Bank Cash and credit White & Co.'s consignment (*i.e.*, White & Co.).

The account for the purchaser may be omitted.

Jany. 22.—Received an account of the sales of the cotton consigned to Bell & Co., of Dublin, showing that the net proceeds due to the business, after deducting all expenses and their commission for selling, amounted to £677 : – : –

Here we credit the Consignment account with £677, and debit the personal account for Bell & Co., who have received the money.

Jany. 23.—Sold cotton to Thomas Heath, on credit . . ' . . . £1,200 : – : –

Debit Heath and credit Cotton.

Jan^{y}. 24.—W^{m}. Wykeham having received a legacy, places the amount (with Martin's consent) in the business . . £1,000 : - : -

Debit Bank Cash and credit Wykeham's (capital) account. It does not matter from what source the partners obtain the money or other property they put into the Business as capital.

Jan^{y}. 25.—Received cheque from Bell & Co. for the balance due by them on the consignment £277 : - : -

Here we debit Bank Cash and credit Bell & Co. We do not credit the Consignment account with this remittance, because that account has already been credited with the whole of the amount realised by the sales, and Bell & Co. have been charged.

Jan^{y}. 26.—Sold the remainder of White & Co.'s consignment, and received a cheque for £300 : - : -

Debit Bank Cash and credit White & Co.'s Consignment account.

Paid out of Office Cash various charges in connection therewith . . . £10 : 5 : -

Debit White & Co.'s Consignment account and credit Office Cash.

Charged our commission on the sales £18 : 15 : -

Debit White & Co.'s Consignment account and credit Commission account.

Jan^{y}. 28.—Allowed Thos. Heath discount £12 : - : -

And received his cheque for . £1,188 : - : -

Debit Trade Discount, and credit Heath with £12; also debit Bank Cash and credit Heath with £1,188.

Jan^{y}. 29.—Remitted to White & Co., in payment of balance due on their consignment £715 : 10 : -

Debit White & Co.'s Consignment account and credit Bank Cash.

Jan^{y}. 30.—The Bank of England return the Liver Cotton Co^{y}.'s bill for £1,200 dishonoured, and charge the business banking account with amount and expenses £1200 : 3 : 6

The immediate liability of the Liver Co^{y}. revives, and we debit their account with £1,200 : 3 : 6, the sum withdrawn by the Bank from the business banking account, and credit the Bank Cash.

Instead of debiting the Liver Co^{y}.'s account, an account for "Past due Bills" is sometimes opened and debited; but we believe this course is not very usual.

Jan^{y}. 31.—Drew a cheque and opened a Deposit account with the London Discount Co^{y}. £2,000 : - : -

Here we place the sum of £2,000 "on deposit" with the Co^{y}.—*i.e.*, we lend them the money on condition that we can have it back at any time upon giving them short notice—or perhaps we place it at call, *i.e.*, on condition we can have it back without notice. The Co^{y}. undertakes to pay interest at a low rate. Debit London Discount Co^{y}. (Deposit) and Credit Bank Cash.

Jan^{y}. 31.—Credit Sundry Creditors with £5, the amount due to Geo. Stewart as interest.

This amount may be credited to the Mortgage account; but as it is a small debt, and will be paid forthwith, it is preferable not to encumber the Mortgage account with it. It is therefore credited to the Sundry Creditors account. The Interest account is, of course, debited with the amount.

Credit W^{m}. Wykeham's Current account with interest on his capital (£11 : 9 : 2) *less interest on* £100 *withdrawn for a fortnight* (£- : 4 : 2) . . . . . £11 : 5 : 0

This amount might be carried to the Capital account for Wykeham, instead of to his Current account; but unless the sum is to remain in the business as a permanent increase of Capital, it is more convenient to place it as now suggested. Debit Interest.

Credit Martin's Current account with interest on his capital (£2,500 *for the first half of the month, and* £2,000 *for the second half*) £9 : 7 : 6

The practice of crediting interest to the partners' account, charging the amount against the business as an expense, is a common one. It is justified on the ground that there is no real profit from a business except in so far as the financial gain is in excess of the income which may be obtained, without active work and without supervision, by investing the capital moneys in the usual securities, instead of employing them in the business.

Credit Charles Sumner with a month's interest on his loan . . . . . . £3 : 2 : 0

The credit may be placed either to Sumner's (loan) account or to the Sundry Creditors' account. Assuming that this accrued interest will shortly be paid, we will adopt the latter course, thus leaving the Loan account to show the normal amount of the loan. Debit Interest.

Write off from the value of the lease, in consideration of one month of the term having elapsed . . . . £4 : 3 : 4
And charge a month's proportion of the annual rent . . . . £8 : 6 : 8

Debit Rent with £12 : 10 : –, and credit £4 : 3 : 4 to the Lease account for depreciation in the value of the lease, and £8 : 6 : 8 to the lessor as one of the Sundry Creditors of the business.

We may assume that the cotton is all sold, and that there is no balance on that account to be carried forward to next month. The Profit and Loss account is now to be made up, and this is done by collecting on one hand the gains shown by the arithmetical balances of the Cotton account, the Consignment to Dublin account, and the Commission account; and on the other hand the losses shown by the arithmetical balances on the Interest and Discount account, the Trade Discounts account, and the Rent account. The former, being gains or "profits," are the credits to the Profit and Loss account, and the latter, being expenses or "losses," are the debits. The excess of the gains over the expenses will be found to be £222 : 14 : 8, and this sum is divided equally between the two partners, one-half of it being carried to each of the partners' accounts, Capital or Current, preferably the former.

The remaining accounts are balanced off, and their balances collected and arranged in a Balance Sheet, as before. We give the Profit and Loss Account and the Balance Sheet, by which the student may check his work.

With reference to the Balance Sheet, it may be observed that the item of Mortgage may be placed under the item of Freehold, to which it is closely related, and the amount of the former formally deducted from the amount of the latter, so as to show the net value of the Freehold, £1,300.

When the student has carefully worked out the ledger accounts, with the assistance of the explanations attached to the items, he may be assured that he will do well to try to reproduce them without such assistance. He should in no case rest satisfied until he thoroughly understands the reason for the treatment any particular item receives.

PROFIT AND LOSS.

1889.		£	s.	d.	1889.		£	s.	d.
Jan. 31	Interest and Discount -	81	10	10	Jan. 31	Cotton - - - -	198	10	6
,, ,,	Trade Discounts - - -	19	10	–	,, ,,	Consignment to Dublin -	69	–	–
,, ,,	Rent - - - - - -	12	10	–	,, ,,	Commission - - -	18	15	–
,, ,,	Wm. Wykeham (Cap.) -	111	7	4					
,, ,,	Martin Martin (Cap.) - -	111	7	4					
		286	5	6			286	5	6

BALANCE SHEET

ON THE 31ST JANUARY, 1889.

(*Liabilities.*)		£	s.	d.	(*Assets.*)		£	s.	d.
Mortgage - - - -		1,200	–	–	Office Cash -	4 : 15 : 6			
Chas. Sumner (Loan) - -		750	–	–	Bank Cash -	839 : 0 : 8	843	16	2
Sundry Creditors - -		96	9	2	Freehold -	2,500 : 0 : 0			
Capital Accounts:					Lease - -	995 : 16 : 8	3,495	16	8
Wm. Wykeham—					London Discount Co. - -		2,000	–	–
(Current)	11 : 5 : 0				Wm. Howard - - -		250	–	–
(Capital)	3,611 : 7 : 4	3,622	12	4	Liver Cotton Co. - -		1,200	8	6
M. Martin—									
(Current)	9 : 7 : 6								
(Capital)	2,111 : 7 : 4	2,120	14	10					
		7,789	16	4			7,789	16	4

GERMAN.—XII.

[*Continued from p. 304.*]

THE AUXILIARY Werden.

Werden is used as an auxiliary in forming the future of all German verbs; and in this use is translated by our auxiliary "shall" or "will."

As an independent verb werden signifies "to become," "to grow," "to get," etc., as:—Er wird alt, he *is growing* old; Das Wetter wird kälter, the weather *is growing* colder; Es wird dunkel, it *is getting* dark; Der Rabe wird ſehr alt, the raven *becomes* very old (lives or attains to a great age).

Werden with the dative often denotes possession, as:—Mir wird immer das Meinige, I always obtain my own (to me comes [*becomes*] always my own); Meinen armen Unterthanen muß das Ihrige werden, my poor subjects must have their own (property).

CONJUGATION OF THE VERB Werden.

INFINITIVE.

PRESENT.	PERFECT.
Werden, to become.	Gewor'den ſein, to have become.

PARTICIPLES.

PRESENT.	PERFECT.
Werdend, becoming.	Geworden, become.

INDICATIVE MOOD.

PRESENT.

Sing.	*Plur.*
Ich werde, I become.	Wir werden, we become.
Du wirſt, thou becomest.	Ihr werdet, you become.
Er wird, he becomes.	Sie werden, they become.

IMPERFECT.

Sing.	*Plur.*
Ich wurde *or* ward, I became.	Wir wurden, we became.
Du wurdeſt *or* wardſt, thou becamest.	Ihr wurdet, you became.
Er wurde *or* ward, he became.	Sie wurden, they became.

PERFECT.

Sing.	*Plur.*
Ich bin geworden, I have become.	Wir ſind geworden, we have become.
Du biſt geworden, thou hast become.	Ihr ſeid geworden, you have become.
Er iſt geworden, he has become.	Sie ſind geworden, they have become.

PLUPERFECT.

Sing.	*Plur.*
Ich war geworden, I had become.	Wir waren geworden, we had become.
Du warſt geworden, thou hadst become.	Ihr waret geworden, you had become.
Er war geworden, he had become.	Sie waren geworden, they had become.

FUTURE IMPERFECT.

Sing.	*Plur.*
Ich werde werden, I shall become.	Wir wird werden, we shall become.
Du wirſt werden, thou wilt become.	Ihr werdet werden, you will become.
Er wird werden, he will become.	Sie werden werden, they will become.

FUTURE PERFECT.

Sing.	*Plur.*
Ich werde geworden ſein, I shall have become.	Wir werden geworden ſein, we shall have become.
Du wirſt geworden ſein, thou wilt have become.	Ihr werdet geworden ſein, you will have become.
Er wird geworden ſein, he will have become.	Sie werden geworden ſein, they will have become.

IMPERATIVE MOOD.

Werde du, become thou.	Werde ihr, become you.
Werde er, let him become.	Werden ſie, let them become.

Often, when repeated or customary action is implied, the genitive of a noun is made to supply

Mittags lieſt, und des Abends ſpielt er, he sleeps in the morning, reads at noon, and plays in the evening.

Als (as),

frequently omitted, but must be supplied in translating, as:—So viel ich weiß, so far as I know; So gut ich kann, as well as I can; Sobald er kommt, as soon as he comes, etc.

EXAMPLES.

[illegible]' er das hörte, ſtand er auf.	As soon (as) he heard that, he stood up (got up).
So viel ich weiß, iſt er ein ehr'licher Mann.	As much (as) I know (so far as I know), he is an honourable man.
Sobald' die Nachricht von dem Verra'the Görgey's eintraf, ſank der Muth der Ungarn.	As soon as the report of the treachery of Görgey arrived, the courage of the Hungarians sank.
Sobald' die Sonne un'tergeht, wird es Nacht.	As soon as the sun goes down, it (becomes) is night.
Was iſt aus ihm gewor'den?	What has become of him?
Die Stunden werden zu Tagen, die Tage zu Wochen, die Wochen zu Mo'naten, und die Mo'nate zu Jahren.	The hours (become) grow to days, the days to weeks, the weeks to months, and the months to years.

VOCABULARY.

Auge, *n.* eye.
Aus'wandern, to emigrate.
Been'digen, to end, finish.
Camerad', *m.* comrade.
Daraus', thereout, therefrom.
Druck, *m.* pressure.
Dürfen, to be permitted.
Erbli'cken, to descry, see.
Erwar'ten, to await.
Fertig, ready.
Finſter, dark.
Fühlen, to feel.
Heiß, hot.
Hoffen, to hope.
Hundert, hundred.
Jahr, *n.* year.
Krieger, *m.* warrior.
Lager, *n.* couch.

Längſtens, at the longest.
Meer, *n.* sea.
Plötzlich, suddenly.
Schlacht, *f.* battle.
Republik', *f.* republic.
Seufzen, to sigh.
Sinken, to sink.
Sobald', as soon as.
Tag'löhner, *m.* day-labourer.
Tauſend, thousand.
Vermö'gen, to be able.
Vor'haben, to intend.
Werden, to become, etc.
Ziel, *n.* limit, goal, aim.
Ziemlich, tolerably.
Zuvor', previously.
Zu'künftig, future.

EXERCISE 56.

Translate into English:—

1. Wir werden alt und älter, und ſind eher am Ziele, als uns angenehm iſt. 2. Es ward ſo finſter, daß wir unſere Hände nicht vor den Augen zu erblicken vermochten. 3. Um fünf Uhr wird es dunkel 4. Stehen Sie des Morgens früh auf? 5. Sobald es Tag wird, verlaſſe ich mein Lager. 6. Wollen Sie dieſes Jahr noch nach Amerika auswandern? 7. Ich habe es vor, aber ich glaube nicht, daß etwas daraus werden wird. 8. Frankreich wurde im Jahre eintauſend achthundert acht und vierzig eine Republik. 9. Gott ſprach: es werde, und es ward. 10. Iſt Ihre neue Grammatik ſchon beendigt? 11. Noch nicht, aber ich hoffe, daß ſie in längſtens vierzehn Tagen fertig werden wird.

EXERCISE 57.

Translate into German:-

1. The present we know, the future [Zukunft] we know not of, and honour to that man who can quietly await the future. 2. Did your sister become suddenly ill? 3. No, she felt a violent headache eight days previously. 4. Do you intend to become a learned man? 5. Let us go home before it gets dark. 6. Most people become ill through neglect.

For "any" and "some," as generally used before a noun, the German has no corresponding word, as:—Haben Sie Brod? have you *some* bread? Haben Sie Seide? have you *any* silk? Ich habe Bücher, I have some books.

The indefinite adjective pronoun "some" is expressed in German by Welcher, welche, welches, as:—Haben Sie Waſſer? Ich habe welches, I have "some."

The genitive of welcher is sometimes expressed, sometimes omitted, and is represented in English by "of" and the personal pronoun, as:—Haben Sie viel Waſſer? have you much water? Ich habe (deſſen) viel, I have much *of it;* Haben Sie viel Hüte? have you many hats? Ich habe (deren) viele, I have many *of them.* From these examples it will be seen that the *partitive* word in German is placed *after* the pronoun, while in English it is placed *before* it. In this use it is declined like the relative welcher.

DECLENSION OF Welcher AS A PARTITIVE.

	Sing.			*Plur.*
	Masc.	*Fem.*	*Neut.*	*of all genders.*
N.	Welcher,	welche,	welches,	welche.
G.	Deſſen,	deren,	deſſen,	deren.
D.	Welchem,	welcher,	welchem,	welchen.
A.	Welchen,	welche,	welches,	welche.

Genug, like "enough," its English equivalent, is indeclinable, and generally follows its noun, or stands independently. Viel and wenig are frequently used without declension.

Das, as also dies (dies being the contraction of the neuter dieſes), is frequently used in referring to nouns of both numbers and all genders, as:—Wer iſt das? who is that? Dies iſt mein Freund, this is my friend; Das ſind Franzoſen, those are Frenchmen. Das and dies, however, never precede and qualify a noun, except of the neuter gender.

Es, like its English equivalent, may refer to nouns of both numbers and all genders, as:—Es iſt mein Freund, it is my friend. When es refers to a noun in the plural, the verb must agree in number with the *noun*, while in English it agrees with the *pronoun*, as:—Es ſind die Ruſſen, die Ungarn überwunden haben, it *is* the Russians who have overpowered Hungary.

Es sometimes answers to our word "so" or "one," as:—Er iſt geſund, oder ſcheint es zu ſein, he is healthy, or appears *so* to be; Er iſt Soldat, aber ich bin es nicht, he is (a) soldier, but I am not one. Es is likewise rendered by "there," as:—Es ſtand in alten Zeiten ein Schloß ſo hoch und hehr (Uhland), *there* stood in ancient times a castle so high and lofty; Es war ein König in Thule (Göthe), *there* was a king in Thule.

Es is often so used as to have no *equivalent* in English, as:—Es reden und träumen die Menſchen viel von beſſern künftigen Tagen (Schiller), men talk and dream much of better days to come; Ich weiß es, daß er da war, I know (it) that he was there; Es leben die Freiheitskämpfer, (long) live the champions of liberty; Es lebe die Republik, (long) live the republic.

EXAMPLES.

Er hat mir Äpfel und Birnen gege'ben.	He has given me (some) apples and pears.
Wollen Sie Brot oder Kuchen haben?	Will you have (some) bread or (some) cake?
Haben Sie feines ſchwarzes Tuch?	Have you (some, any) fine black cloth?
Hat er Geld genug', oder hat er keines?	Has he money enough, or has he none?
Er hat (deſſen) genug'.	He has enough (of it).
Hat ſie Bücher genug'?	Has she books enough?

Sie hat deren genug', aber zu wenig Zeit, dieſel'ben zu leſen.	She has enough of them, but too little time to read them.
Wiſſen Sie, wer das iſt?	Do you know who that is?
Es iſt mein Vater, meine Mutter, mein Kind.	It is my father, my mother, my child.

VOCABULARY.

Arzt, *m.*	physician.
Fleiß, *m.*	diligence.
Gelehr'ſamkeit, *f.*	erudition, learning.
Glück, *n.*	luck, fortune, happiness.
Gram, *m.*	grief, affliction, sorrow.
Klug,	prudent, judicious.
Köchin, *f.*	cook.
Kummer, *m.*	anxiety, distress.
Kurz,	short.
Milch, *f.*	milk.
Nagel, *m.*	nail.
Pulver, *n.*	powder.
Stahl, *m.*	steel.
Stolz, *m.*	pride.

EXERCISE 58.

Translate into English: —

1. Wie alt is dieſer Mann? 2. Er iſt nicht ſehr alt. 3. Hat er viel Geld? 4. Ja, und er hat auch viele Freunde und viele Feinde. 5. Welcher Knabe hat viele Äpfel und Birnen? 6. Einer von den Söhnen des Bauern hat viele Äpfel, der andere viele Birnen. 7. Der eine hat viel Glück, der andere hat nur Gram und Kummer. 8. Wie viel Brod hat der Bäcker? 9. Er hat ſehr viel Brod, aber nur wenig Mehl. 10. Dieſer Mann hat wenig Geld, aber viel Verſtand. 11. Dieſe Stiefel ſind mir viel zu groß, und die Schuhe ſind meinem Bruder ein wenig zu kurz. 12. Wird Ihr Oheim viel Pulver kaufen? 13. Er wird nur wenig kaufen, denn er hat zu wenig Geld. 14. Wer iſt das? 15. Es iſt ein alter Freund des Arztes. 16. Wer hat gutes Waſſer? 17. Der Matroſe hat welches. 18. Werde ich morgen die Bücher bekommen? 19. Sie ſollen ſchon heute welche haben. 20. Hat der Bauer viel Weizen? 21. Er hat deſſen nicht viel. 22. Hat der Schmied viel Stahl? 23. Er hat (deſſen) viel. 24. Hat er viele Nägel? 25. Er hat (deren) viele. 26. Wer hat Milch? 27. Der Bauer hat welche. 28. Hat er (deren) ſehr viel? 29. Er hat genug.

EXERCISE 59.

Translate into German:—

1. We must be cautious in the choice of him to whom we confide important concerns. 2. They that (who) speak evil of others are often worse than those whose failings they lay open. 3. He professed that religion whose origin is divine. 4. This boy has too much pride and too little diligence. 5. That is the man through whose help he was saved. 6. Which pleased you the most — this or that? Neither. 7. Can those be loved whose vices are detested by everybody? 8. How many hats has that boy? 9. He has three of them. 10. Who sells here good bread? 11. Our baker sells very good bread.

IMPERSONAL VERBS.

Impersonal verbs are confined to the third person singular, and have as their subject or nominative only the pronoun es, as:—Es regnet, it rains; Es donnert, it thunders; Es blitzt, it lightens.

Besides those verbs that are merely impersonal, others may be thus employed, as:—Es ſcheint, daß er krank iſt, it appears that he is sick; Es ſchmerzt mich, das zu hören, it pains me to hear that, etc.

Many verbs, however, that in German are used impersonally have in this respect no verbs of the same kind in English to correspond, as:—Es gelingt mir, I succeed (it succeeds to me), etc.

Geben, "to give," is often, with its proper case (the accusative), employed to denote *existence* in a manner general and indefinite, and is translated like ſein, "to be," as:—Es giebt (not es ſind) Leute, die alle Tage auf den Markt gehen, there are (*i.e.*, there *exist*) people who go to the market every day; Es giebt keine Roſen ohne Dornen, there are (there *exist*) no roses without thorns; Es giebt (there *exist*) noch Rieſen in der Welt, there are still giants in the world.

EXAMPLES.

Es wird immer Leute geben, die ſich gegen die hellſten Wahrheiten empö'ren, wie viele giebt es deren heute zu Tage nicht!	There will always be people who exalt themselves against the clearest truths; how many of those are there (not) at the present day!
Es war einmal ein Weiſer, welcher behaup'tete, daß es kein beſſeres Gut gebe, als eine geſun'de Vernunft' in einem geſun'den Körper.	There was once a sage who maintained that there was no better possession than a sound understanding in a sound body.
Ei'nige behaup'ten, daß es Ein'wohner im Monde gebe.	Some maintain that there are inhabitants in the moon.
Es iſt kein Menſch un'glücklicher, als der, welcher nie Wi'derwärtigkeiten erdul'dete.	There is no mortal more unfortunate than he (that one) who never endured reverses of fortune.
Es giebt wenig Helden, die ihren Charac'ter bis in ihr Alter behaup'ten.	There are few heroes who maintain their character till (in) their old age.
Es iſt nichts lo'benswerther, als andere das'jenige zu lehren, was man weiß.	There is nothing more praiseworthy than to teach what one knows to others.

VOCABULARY.

Armee', *f.* army.
Aufgang, *m.* rising, ascent.
Bis, until, up to.
Blitzen, to lighten.
Brechen, to break.
Ding, *n.* thing, affair.
Donnern, to thunder.
Edel, noble, magnanimous.
Eis, *n.* ice.
Erklä'ren, to explain.
Feindlich, hostile.
Fürchten, to fear.
Georg', *m.* George.
Hageln, to hail.
Leicht, easy, easily.
Reißend, ravenous.
Rückzug, *m.* return.
Schneien, to snow.
Stürmen, to storm.
Tagen, to dawn, become day.
Thauen, to thaw.
Verge'ben, to forgive.
Wahr, true.
Wolf, *m.* wolf.
Zuflucht, *f.* refuge.

EXERCISE 60.

Translate into English :—

1. Es giebt dieſes Jahr ſehr viel Obſt. 2. Es iſt heute ſehr ſchönes Wetter. 3. Es giebt mehr arme, als reiche Leute. 4. Es iſt ein wahres Vergnügen, dieſen Morgen ſpazieren zu gehen. 5. Giebt es in Deutſchland auch reißende Thiere? 6. Es giebt noch viele Wölfe in den Gebirgen. 7. Die feindliche Armee iſt auf ihrem Rückzuge. 8. Giebt es etwas Schöneres, als den Aufgang der Sonne? 9. Es hat den ganzen Tag geſchneit. 10. Gehen Sie dieſen Nachmittag mit mir auf's Eis? 11. Nein, es thaut ſchon, und das Eis kann leicht brechen. 12. Wenn es tagt, werde ich Sie zu einem Spaziergang abholen? 13. Es ſchneit heute den ganzen Tag. 14. Regnet es ſchon? 15. Nein, aber es wird bald anfangen zu regnen. 16. Wie lange hat es geregnet? 17. Es hat bis vier Uhr geregnet. 18. Donnert es? 19. Ja, es donnert und blitzt, und ich fürchte, daß es auch hageln wird.

EXERCISE 61.

Translate into German :—

1. It seemed this morning as if it would rain, but now the weather begins to be fine. 2. It happened that it rained just as the battle commenced, and it thundered and hailed throughout the whole day. 3. It has rained, hailed, snowed, and frozen this winter. 4. As long as it rains I cannot depart. 5. It appears that there are many strangers in this hotel. 6. There are (exist) many things which we cannot explain. 7. As soon as it becomes day I shall call upon you to go and see the rising of the sun. 8. Exists there anything more noble than to forgive an enemy? 9. Do you intend to go to-morrow with me upon the ice? 10. No, I fear that it thaws already, and it would be dangerous to venture it. 11. As soon as the wind abates it will rain.

REFLECTIVE VERBS.

Reflective verbs are those that represent the subject as acting upon itself, as :—**Er beſinnt ſich**, *he* bethinks *himself*, etc.

Verbs of this class are much more numerous than in English, and are variously translated, as :—**Er macht ſich über mich luſtig**, he makes himself merry over me (*i.e.*, he ridicules me); **Er härmt ſich über ſeinen Verluſt**, he mourns over (*or* on account of) his loss; **Er freut ſich über ſein Glück**, he rejoices at his prosperity; **Er widerſetzt ſich den Befehlen des Tyrannen**, he opposes (himself to) the commands of the tyrant; **Das Buch hat ſich gefunden**, the book has been found (active form, the book has made its appearance); **Der Himmel bedeckt ſich mit Wolken**, the sky is covered with clouds; **Soll der Frevel ſich vor unſern Augen vollenden?** shall the outrage be accomplished before our eyes? **Er hält ſich in Berlin auf**, he (holds himself up) stops in Berlin; **Er hat ſich bei der Arbeit zu lange aufgehalten**, he has (kept himself) remained too long at the work.

Sich aufhalten über signifies to find fault with, to sneer at, to criticise, to blame, as :—**Er hält ſich immer über Kleinigkeiten auf**, he is always finding fault about trifles (stopping over trifles); **Er hält ſich über Ihren Brief auf**, he criticises your letter; **Er hält ſich über die ganze Geſellſchaft auf**, he sneers at the whole company.

Many verbs in German, as in other languages, especially when used as reflectives, acquire in certain phrases a figurative sense which deserves to be noted. Thus from **ſchicken**, "to send," we have the reflective **ſich ſchicken**, "to send or throw oneself into," *i.e.*, *to adapt* or *conform to*, as :—**Der Menſch muß ſich in die Zeit, in ſeine Umſtände ſchicken**, man must adapt himself to the times, to his circumstances; **Es ſchickt ſich nicht, das zu thun**, it is not proper to do that. So from **fragen**, "to ask," we have **ſich fragen**, "to *be questionable*," as :- **Es fragt ſich, ob er da war**, it is questionable whether he was there. **Sich zutragen, ſich handeln**, etc., are of the same character, as :—**Es trägt ſich zuweilen zu, daß anhaltender Regen die ganze Ernte verdirbt**, it happens sometimes that continued rain destroys the entire harvest; **Er handelt ſich nicht um Kleinigkeiten**, it is not a question (an affair) of trifles.

EXAMPLES.

Der Kaiſer hielt ſich letzten Winter in der Hauptſtadt auf.	The emperor remained in the capital last winter.
Der Spötter hält ſich über Andere auf.	The derider sneers (finds fault with) at others.
Das Volk empört' ſich gegen den König.	The people rebel (rise) against the king.

VOCABULARY.

Alter, *n.* age.
An'eignen, to appropriate.
Annehmen, to adopt.
Atmoſphä're, *f.* atmosphere.
Auf'halten, to sojourn, lodge.
Aus'dehnen, to extend, expand.
Aus'zeichnen, to mark, distinguish (oneself).

Bedürf'niß, *n.* want, necessity.
Beloh'nen, to reward.
Beſtän'dig, continually.
Bewe'gen, to move.
Dampf, *m.* steam, vapour.
Darben, to suffer want.
Dunſt, *m.* exhalation, smoke.
Empö'ren, to rebel, to make insurrection.
Entſte'hen, to arise.
Gegen, against.
Gewöh'nen, to accustom.
Gewohn'heit, *f.* habit, custom.
Gewöl'be, *n.* arch, vault.
Gläu'big, believing.
Indem, while.
Karl, *m.* Charles.
Kraft, *f.* force, power.
Kühn, daring.
Lagern, to encamp.
Lei'denſchaftlich, passionately.
Mee'reswoge, *f.* ocean-billow.
München, *n.* Munich.
Muskel, *m.* muscle.
Natur', *f.* nature.
Nebel, *m.* mist, fog.
Nennen, to name, to call, to denominate.
Oft, often.
Öſt'reichiſch, Austrian.
Palaſt, *m.* palace.
Prachtvoll, splendid, gorgeous.
Raum, *m.* room, space.
Regen, *m.* rain.
Regie'rung, *f.* government.
Reihe, *f.* row, range.
Sammeln, to gather, collect.
Schaden, to hurt, injure.
Selbſt, self.
Slave, *m.* Slavonian.
Strudel, *m.* whirlpool.
Stürzen, to plunge.
Taucher, *m.* diver.
Toben, to rage, to roar.
Übel, evil.
Üben, to exercise.
Unermeß'lich, immeasurable.
Un'gemach, *n.* affliction.
Unzäh'lig, innumerable.
Verbin'den, to unite, combine.
Vertrau'en, to confide in, to trust.
Waffen, *f.* arms, weapons.
Wagen, to venture, risk.
Wind, *m.* wind.
Zeigen, to show, exhibit.
Zuſam'menziehen, to contract, to draw together.

EXERCISE 62.

Translate into English :—

1. Alle Dünſte und Dämpfe, welche beſtändig von der Erde aufſteigen, ſammeln ſich in der Atmoſphäre, und indem ſie ſich verbinden, entſteht daraus Regen, Schnee, Nebel, und jede andere Veränderung in der Luft. 2. Derjenige, der ſich in der Jugend an Arbeit gewöhnt, braucht im Alter nicht zu darben. 3. Die Ludwigſtraße in München zeichnet ſich durch eine Reihe prachtvoller Paläſte aus. 4. Diejenigen Perſonen, welche ſich ſelbſt loben, machen ſich ſehr oft lächerlich. 5. Die Söhne Karls des Großen mußten ſich in dem Waffen, im Reiten und im Schwimmen üben. 6. Der kühne Taucher wagt es ſich in den tobenden Strudel zu ſtürzen. 7. Der Neidiſche ſchadet ſich ſelbſt mehr, als andern. 8. Friedrich der Große hielt ſich oft zu Potsdam, im Schloſſe Sanssouci, auf. 9. Die Güte belohnt ſich ſelbſt. 10. Der Gläubige zeigt ſich im Ungemach wie ein Fels im Meere, wenn die Meereswogen um ihn toben.

EXERCISE 63.

Translate into German :—

1. The youth mourns at the loss of his parents. 2. Mother was pleased when the letter from my sister was read to her. 3. She consoled herself with the thought that she would arrive soon. 4. Will you sojourn long in Italy? No, it is not my intention. 5. An honest man fears nothing. 6. The Slavonians have rebelled against the Austrian government. 7. The English troops distinguished themselves at the battle of Waterloo by their bravery. 8. He who rejoices at the downfall of another deserves not the approbation of the virtuous. 9. He who is vexed when another is praised in his presence is a man who does not deserve to be loved and honoured.

KEY TO EXERCISES.

Ex. 48.—1. This hunter has a fine dog, mine is finer, and yours is the finest of all. 2. The earth is smaller than the sun, and the stars are more distant than the moon. 3. Virgil is a more agreeable writer than Ovid. 4. The city of Canton is larger than Paris. 5. Alexander the Great had less prudence than courage. 6. We find much more copper than silver, and more iron than tin. 7. This girl prattles more than she works. 8. The air in the towns is more impure than the country air. 9. France is not so fertile as Germany. 10. This youth has not as much understanding as his brother, but neither has he as much vanity. 11. The rose is one of the finest flowers in the world. 12. Those are commonly the least proud whose minds are the most educated. 13. The manners of those with whom we have intercourse are commonly influential upon us. 14. The benefits that we are worthy of are more agreeable to us than those we are unworthy of. 15. He is the richest man whose children are virtuous. 16. The Lord has no pleasure in those people who have no love to their brothers. 17. The apple-tree has a thick trunk, the beech has a thicker trunk, and the oak has the thickest trunk. 18. The more he has, the more he wants. 19. Florence is finer than Parma.

Ex. 49.—1. Je häufiger unſer Umgang mit Völkern iſt, deſto mehr wird unſer Handel erweitert. 2. Sind die Paläſte der Könige von England ſo ſchön, als die der deutſchen Könige? 3. England iſt nicht ſo fruchtbar wie Spanien oder Italien. 4. Es iſt ebenſo leicht, gut zu thun, als übel. 5. Die Tugend iſt die größte Zierde des Mannes. 6. Ein Weiſer ſagte, je mehr er die Unſterblichkeit der Seele erwäge, deſto wichtiger erſcheine ſie ihm. 7. Der Rhein bietet die ſchönſte Ausſicht dar. 8. Die Landluft war in der Herſtellung dieſes Jünglings wohlthätiger, als die Behandlung des geſchickteſten Arztes. 9. Ovid iſt ein nicht ſo angenehmer Schriftſteller, als Virgil. 10. Der Frühling iſt veränderlicher, als der Herbſt. 11. Dieſe Ausſicht iſt ſchön, aber die Ausſicht von jenem Hügel iſt ſchöner. 12. Auguſtus war vielleicht kein größerer Mann als Antonius, aber er war glücklicher als dieſer. 13. Unter allen Blumen iſt die Roſe am ſchönſten, wenn nicht das Veilchen noch ſchöner iſt. 14. Die Geſellſchaft jenes Jünglings iſt nicht ſo angenehm, als die ſeines Bruders. 15. Mont Blanc iſt ein hoher Berg, aber der Chimboraſſo iſt höher, und der Mont Evereſt iſt der höchſte. 16. Tugend iſt mehr (or höher) zu ſchätzen als Reichthum. 17. Die Soldaten gehen nach Wien. 18. Der Holzhauer haut die höchſte Buche des Waldes ab. 19. Rom iſt die Hauptſtadt von Italien. 20. Die Sterne am Himmel ſcheinen hell. 21. Sie iſt mehr ſchön als liebenswürdig. 22. Je lauter der Mann ſchrie, deſto ſchneller lief der Knabe. 23. Der Schiffer ruderte ſchnell über den Fluß.

Ex. 50.—1. Will your son hold my horse? 2. He did hold it, but he has received a letter which he wants to read. 3. How has this boy behaved? 4. He has behaved well; he has carried my umbrella. 5. The Russians have found a brave hero. 6. The Germans have invented many useful arts. 7. This beggar has stood an hour at the door; he has not understood me. 8. Has the shoemaker time to make me a pair of boots? 9. He has no time to make you boots; he has promised too much to others. 10. Has the peasant more coffee to drink than bread to eat? 11. He has bread enough to eat and water to drink, but he has no coffee. 12. Have you the same books which my neighbour has had? 13. Has the sailor answered his brother? 14. No, I have answered his letter.

Ex. 51.—1. Sie haben die Fremden mir und Ihnen empfohlen. 2. Es wohnt in Neapel einer meiner Freunde, ich werde ihn an Sie empfehlen. 3. Einer meiner Freunde; welchen Sie bei mir geſehen haben, hat Amerika bereiſt, und mir einen Brief geſchrieben, in welchem er ſeine Reiſe beſchreibt. 4. Ein Mann von Ehre erniedrigt ſich vor Niemanden, in welcher Lage er ſich auch befinden mag. 5. Erhielten Sie die Neuigkeiten vor uns? 6. Ich erhielt ſie nach Ihnen; die ganze Nachbarſchaft wurde auch davon unterrichtet, als wir Ihren Brief erhielten. 7. Die Kinder verſprachen dem Vater, gehorſam zu ſein. 8. Vortheile können aus dieſer Erfindung entſpringen, welche Niemand berechnen kann.

Ex. 52.—1. Will you have a pattern from this cloth or that? 2. I will have neither. 3. We give him a dollar for each of the two men. 4. Do you drink wine or beer? 5. I drink neither wine nor beer (*or*, I drink neither). 6. You are right in having done this. 7. Is John right in remaining out so long? 8. No, he is wrong, as he has to learn his exercises. 9. How much cloth does little Frederick require for a summer coat? 10. He requires just as much as for a winter coat. 11. The state of Pennsylvania furnishes just as much coal as the whole of England. 12. Does not Gustavus work just as much as his brother Hermann? 13. Little Eliza gave her sister Paulina just as many plums as her friend Emma. 14. Have not our neighbours a garden yet? 15. No, they have not one yet. 16. Shall you still remain a long while in the country? 17. I shall still remain a short time, and my friends also. 18. Are you going to take another walk to-day? 19. No, because I must still work. 20. The tears of joy of the long-separated friends affected the hearts of all spectators. 21. Can you not sell these goods cheaper? 22. It is quite impossible. 23. You must do this differently. 24. What can I do otherwise? 25. You can speak and act differently. 26. I shall visit you, if you allow it. 27. He narrated this affair quite differently. 28. It makes a difference whether I write, He is "learned," or "empty."

Ex. 53.—1. Hat der Lehrer das Papier oder das Buch weggenommen? 2. Er hat Beides weggenommen; denn Beides gehört ihm. 3. Beide Städte liegen an ſchiffbaren Flüſſen. 4. Sie mögen eine jede Richtung nehmen, da ſie ſo weit fortgeſchritten ſind. 5. Ein großer Theil des Landes in Amerika iſt noch unangebaut. 6. Derjenige, welcher den Zweck will, muß auch das Mittel wollen. 7. Das Dampfſchiff, Rhein, iſt ſoeben nach Holland abgeſegelt. 8. Sie irren ſich völlig, wenn Sie ſagen, daß Sie jede Schwierigkeit ganz überwunden haben, wo nicht, ſo würde alles, was Sie vorgegeben haben, richtig ſein. 9. Welcher von uns hat Recht, ich oder er? 10. Sie haben beide Unrecht. 11. Es iſt etwas ganz anderes zu ſagen, daß er unwohl ſei, und in Folge deſſen nicht kommen könnte. 12. Ich werde nicht mehr davon ſprechen, denn ich habe bei genauer Unterſuchung gefunden, daß er weder habſuchtig, noch verſchwenderiſch iſt. 13. Sie halten ſich ſelbſt nicht für beſſer als andere. 14. Emma iſt ebenſo verſtändig als Eliſa. 15. Der Matroſe ſegelt morgen nach Amerika ab. 16. Trinken Sie Wein oder Bier? 17. Ich trinke weder Wein noch Bier, ich trinke immer Waſſer. 18. Guſtav gab dem Knaben einen Thaler, um Kohlen für ſeine Mutter zu kaufen. 19. Pennſylvanien iſt ein richter und blühender Staat in den Vereinigten Staaten von Amerika. 20. Sie iſt gerade wie ihre Schweſter. 21. Gieb dem Knaben noch einige Pflaumen. 22. Ich habe keine mehr. 23. Das Mädchen vergoß Freudenthränen, als ſie ihre Mutter ſah. 24. Jene Waare iſt billig, und das Muſter derſelben iſt ſchön. 25. Mein Freund hat einen neuen Winterrock gekauft. 26. Dieſer Kaufmann ſchickt ſeine Waaren auf einem Wagen in die Stadt. 27. Wollen Sie morgen einen Spaziergang machen? 28. Es iſt unmöglich.

Ex. 54.—1. These great beautiful houses are all to let. 2. The one house is to let, the other to sell. 3. It is not to be believed that he has forsaken us. 4. This book is to be had of Mr. Westermann in Brunswick. 5. Not one single star was to be seen in the whole heavens. 6. How is this long word to be pronounced? 7. Where are the best boots, shoes, and over-shoes to be found? 8. The best which I have seen are to be found at my old neighbour N.'s. 9. The fire burnt so rapidly that nothing was to be saved in the castle. 10. Nothing valuable is to be gained without trouble. 11. This high rock is not to be climbed. 12. This old house is to be repaired no more. 13. Through this forest one cannot get. 14. He is neither to be convinced nor to be persuaded. 15. His behaviour is not at all to be pardoned. 16. What is your friend's name? 17. He is called James. 18. How is this called in German? 19. It is called Brille (spectacles). 20. The more perfect a work of art is (that is, the more parts it has, and the more all these parts contribute to the purpose), the more beautiful it is.

Ex. 55.—1. Die Ausſprache fremder Wörter iſt nur durch Übung zu erlernen. 2. Nichts iſt ohne Mühe zu erlernen. 3. Vollkommene Glückſeligkeit iſt in dieſer Welt nicht zu finden. 4. Sie ſprechen ſo ſchnell, daß Sie nicht zu verſtehen ſind. 5. Die Geſundheit iſt mit Geld nicht zu erkaufen. 6. Die Ruhe der Stadt war durch ſtrenge Befehle nicht herzuſtellen. 7. Wie nennen Sie dieſe Blumen? 8. Sie werden Tulpen genannt. 9. Die klugen Schüler ſind zu loben. 10. Der Unterſchied zwiſchen kaufen und verkaufen muß den Schülern zu dieſer Zeit bekannt ſein. 11. Dieſes Buch iſt bei dem Buchhändler C. in London zu haben. 12. Ein werthvolles Kunſtwerk kann nicht ohne viel Mühe gemacht werden. 13. Die Roſe und das Veilchen werden wegen ihres Wohlgeruchs geſchätzt, die Tulpe wegen des Glanzes ihrer Farken. 14. Jakob geht morgen nach Braunſchweig. 15. Die Himmel verkündigen die Herrlichkeit Gottes.

ARITHMETIC.—XII.

[*Continued from p.* 293.]

DECIMALS IN CONNECTION WITH COMPOUND QUANTITIES—REDUCTION OF DECIMALS.

1. *To reduce any given Compound Quantity to the Decimal of another given Compound Quantity of the same kind.*

This is the name given to the process of finding, in the form of a decimal, what fraction the one quantity is of the other; or, in other words, of expressing the *ratio* of the two quantities as a decimal fraction.

Hence, clearly, all we have to do is to find the ratio of the two quantities expressed as a vulgar fraction, and then to reduce that fraction to a decimal.

Thus 4s. is £$\frac{1}{5}$, and $\frac{1}{5} = {\cdot}2$.

Hence 4s., reduced to the decimal of a pound, is £·2.

Again, 14s. 6d. = £$\frac{29}{40}$.

And we find, as in the margin, that $\frac{29}{40}$, expressed as a decimal, is ·725.

$$\begin{array}{r} 40)29{\cdot}000 \\ \hline {\cdot}725 \end{array}$$

Hence, 14s. 6d., reduced to the decimal of a pound, is £·725.

2. But instead of reducing the whole of the one compound quantity to the fraction of the other, and then reducing this fraction to a decimal, we can in many cases obtain the result more conveniently by reducing the separate portions successively to decimals of the next higher denomination.

Thus, if it be required to reduce £3 4s. 4½d. to the decimal of a pound, we may proceed as follows:—

$\frac{1}{2}$d. = ·5 of a penny.
Therefore 4$\frac{1}{2}$d. = 4·5 ,,
And 4$\frac{1}{2}$d. = $\frac{4{\cdot}5}{12}$ of a shilling = ·375 of a shilling.
Therefore 4s. 4$\frac{1}{2}$d. = 4·375 of a shilling.
And 4s. 4$\frac{1}{2}$d = $\frac{4{\cdot}375}{20}$ of a pound.
= ·21875 ,,

Hence £3 4s. 4½d., reduced to the decimal of a pound, is £3·21875.

In practice we should arrange the process thus:—

$$\begin{array}{rll} 4) & 2{\cdot}0 & \text{farthings.} \\ \hline 12) & 4{\cdot}5 & \text{pence.} \\ \hline 20) & 4{\cdot}375 & \text{shillings.} \\ \hline & 3{\cdot}21875 & \text{pounds.} \end{array}$$

Writing down the two farthings, and dividing by 4, we get ·5 pence, before which we place the 4d. of the given sum. Dividing this again by 12, we get ·375 shillings, before which we place the 4s. of the given sum; and, similarly, dividing this by 20, we get ·21875 pounds, before which we place the 3 pounds of the given sum.

3. **Example.**—Reduce 5 days 3 hours 36 minutes to the decimal of 3 weeks.

$$\begin{array}{rll} 60) & 36{\cdot}00 & \text{minutes.} \\ \hline 24) & 3{\cdot}60 & \text{hours.} \\ \hline 7) & 5{\cdot}150000 & \text{days.} \\ \hline 3) & {\cdot}73\dot{5}7142\dot{8} & \text{weeks.} \\ \hline & {\cdot}24\dot{5}2380\dot{9} & \text{decimal of 3 weeks.—Answer.} \end{array}$$

4. *To reduce a Decimal of any Compound Quantity to successive lower Denominations.*

For instance, suppose it be required to reduce £3·21875 to pounds, shillings, and pence.

This is the reverse process to that already explained in Art. 2.

Now £·21875 = £$\frac{21875}{100000}$ = $\left.\frac{21875 \times 20}{100000}\right\}$ shil. = $\frac{437500}{100000}$ = 4.375 shil.

·375 shil. = $\frac{375}{1000}$ shillings = $\frac{375 \times 12}{1000}$ pence = $\frac{4500}{1000}$ = 4·5 pence.

And ·5 pence = $\frac{5}{10}$ pence = $\frac{5 \times 4}{10}$ farthings = $\frac{20}{10}$ = 2 farthings.

Hence, £3·21875 = £3 4s. 4½d.

An examination of the above will sufficiently explain the following method of arranging the work:—

$$\begin{array}{rl} £3{\cdot}21875 & \\ 20 & \\ \hline 4{\cdot}37500 & \\ 12 & \\ \hline 4{\cdot}500 & \text{(leaving out unnecessary} \\ 4 & \quad\text{ciphers.)} \\ \hline 2{\cdot}0 & £3\ 4\text{s. } 4\tfrac{1}{2}\text{d.—Answer.} \end{array}$$

Notice that the *decimal part* only of each line is multiplied.

5. Hence we get the following

Rule for finding the Value of a Decimal of any one Denomination in successive Lower Denominations.

Multiply the decimal part by the number of units of the next lower denomination which makes one of the denomination in which the decimal is expressed, and cut off from the result a number of decimal places equal to the number in the multiplicand. The integral part in this result will express the number of units of the lower denomination. Proceed to reduce the remaining decimal part to the next lowest denomination exactly in the same way, and continue the process until the lowest required denomination is arrived at.

6. **Example.** — Reduce ·4258 days to hours, minutes, etc.

$$\begin{array}{rl} {\cdot}4258 & \\ 24 & \\ \hline 17032 & \\ 8516 & \\ \hline 10{\cdot}2192 & \text{hours.} \\ 60 & \\ \hline 13{\cdot}1520 & \text{minutes.} \\ 60 & \\ \hline 9{\cdot}1200 & \text{seconds} \end{array}$$

Hence ·4258 days = 10 h. 13 m. 9·12 s.

7. It is evident that, since each of the two processes we have explained is the converse of the other, we can prove the correctness of our operations in any case by reducing the result to the original form.

Thus we showed that £3 4s. 4½d was £3·21875, and then, by the converse process, we proved that £3·21875 = £3 4s. 4½d.

8. **Example.**—Reduce $\cdot 21\dot{7}\dot{3}$ of a pound to shillings, pence, etc.

This may be performed in two ways.

$$\begin{array}{r} \cdot 21\dot{7}\dot{3} \\ 20 \\ \hline 4\cdot 3\dot{4}\dot{7} \\ 12 \\ \hline 4\cdot 16\dot{9} \\ 4 \\ \hline \cdot 6\dot{7}\dot{8} \text{ farthings.} \end{array}$$

Hence £$\cdot 21\dot{7}\dot{3}$ = 4s. 4d. and $\cdot 6\dot{7}\dot{8}$ farthings.

Here, in multiplying, we are obliged to take in additional figures of the recurring period, in order to obtain the recurring period after the multiplication correctly; and this might give rise to considerable trouble if the number of figures in the recurring period were large. It will be often better, therefore, in such cases, to reduce the recurring decimal to a vulgar fraction, and proceed to perform the operation as follows :—

$$£\cdot 21\dot{7}\dot{3} = \frac{£2173 - 21}{9900} = £\tfrac{2152}{9900} = £\tfrac{538}{2475}.$$

$$£\tfrac{538}{2475} = \frac{538 \times 20}{2475} \text{ shillings} = \tfrac{2152}{495} \text{ shillings} = 4\tfrac{172}{495} \text{ shillings}.$$

$$\tfrac{172}{495} \text{ shillings} = \frac{172 \times 12}{495} \text{ pence} = \tfrac{688}{165} \text{ pence} = 4\tfrac{28}{165} \text{ pence}.$$

$$\tfrac{28}{165} \text{ pence} = \frac{28 \times 4}{165} \text{ farthings} = \tfrac{112}{165} \text{ farthings}$$

$$\begin{array}{l} 165\,)\ 112.000\ (\,\cdot 678 \\ \quad\ \ \ \ \ 990 \\ \quad\ \ \ \ \ \overline{1300} \\ \quad\ \ \ \ \ 1155 \\ \quad\ \ \ \ \ \ \overline{1450} \\ \quad\ \ \ \ \ \ 1320 \\ \quad\ \ \ \ \ \ \overline{\ 130} \end{array}$$

Hence £$\cdot 21\dot{7}\dot{3}$ = 4s. 4d. and $\cdot 6\dot{7}\dot{8}$ farthings.

Exercise 59.—Examples in Reduction of Decimals.

Reduce—

1. 4s. 9d. to the decimal of £1.
2. 10s. 9d. to the decimal of £1.
3. 17s. 7d. to the decimal of £1.
4. 6¾d. to the decimal of a shilling.
5. 2 furlongs 2 rods to the decimal of a mile.
6. 3 hours 3 minutes to the decimal of a day.
7. 5 lb. 4 oz. to the decimal of a cwt.
8. 15 minutes 30 seconds to the decimal of an hour.
9. 7 ounces 8 drachms to the decimal of a pound.
10. 1 guinea to the decimal of a moidore (27s.), and 2s. 6d. to that of 1 guinea. Deduce from your results what decimal 2s. 6d. is of a moidore.
11. 2 roods 10 perches to the decimal of an acre.
12. 18s. 10¼d. to the decimal of a guinea.
13. What decimal is a day of a year, and 3s. 7¾d. of 18s. 2¾d.?
14. What decimal is a pound of a cwt., and 2s. 9¼d. of 13s. 10¼d.?
15. Express ⅜ of 8 lb. 8 oz. as a decimal of 2 qrs. 15 lb. 7 oz.
16. Reduce $\cdot\dot{4}3$ of £2 17s. 6d. to the decimal of £5 15s.

Find the value of—

17. £·725 in shillings, etc.
18. £·1325 in shillings, etc.
19. ·825s. in pence, etc.
20. ·435 lb. in ounces and drachms.
21. ·275 miles in rods, yards, etc.
22. ·4258 days in hours, etc.
23. ·845 hours in minutes, etc.
24. Reduce 4s. 7¼d. to the decimal of ·01 of £1.
25. Find $\cdot\dot{3}$ of a pound in shillings, pence, etc.
26. Reduce $\dfrac{\frac{1}{3} + \frac{3}{28} + \frac{3}{127}}{\frac{1}{3} + \frac{2}{9} + \frac{4}{27}}$ of £1 to the decimal of a guinea.

Find the value of—

27. $\cdot 890\dot{6}2\dot{5}$ of £1 in shillings, pence, etc.
28. $\cdot 27 \times \dot{1}$ of 2s. 9⅑d., and reduce the result to the decimal of a pound to 4 places.
29. ·23 of £2 + ·345 of 8s. 6d. — 1·35 of 5s.
30. $\dfrac{\cdot 3 + \cdot 125 - \frac{5}{12}}{\cdot 2\dot{3}\dot{5} - \cdot 03}$ of a cubic yard

SHORT METHODS OF REDUCTION WITH REFERENCE TO MONEY.

We now proceed to explain two or three artifices which are often of considerable use.

9. *To find out how much a Given Sum per Day amounts to in a Year.*

There are 240 pence in a pound, and 360 = 240 + 120, or 240 + $\frac{240}{2}$; and therefore one penny per day amounts to one pound and half a pound in 360 days.

Hence, to find how much a given sum per day amounts to in 365 days, we have only to reduce the sum to pence, and add half the number of pence to the result. This will give the number of *pounds* to which the sum will amount in 360 days. To find the amount in one year (365 days), we must add 5 times the sum per day to the pounds found by the first part of the process.

Thus 6d. a day is £9 2s. 6d. a year;
For 6d. + 3d. = 9d., and therefore 6d. a day amounts to £9 in 360 days, and therefore to £9 2s. 6d. in 365 days.

Observe that since a penny (after half of the number of pence has been added) corresponds to a pound for 360 days, a halfpenny corresponds to 10s., and a farthing to 5s.

Thus 7d. a day will amount to £10 10s. in 360 days,
and therefore to £10 12s. 11d. in 365 days.

For 7d + (½ × 7d.) = 10½d., which corresponds to £10 10s. for the 360 days. Adding 5 × 7d., or 2s. 11d., we get £10 12s. 11d. for a year.

Example.—Again, to find how much 2s. 6½d. a day amounts to in a year.

2s. 6½d. = 30½d.
30½d. + ½(30½d.) = 45¾d.
and hence in 360 days 2s. 6½d. amounts to £45 15s.,
and therefore, in 365 days, to £45 15s. + 5 (2s. 6½d.), or to
£46 7s. 8½d.

10. *To reduce a Given Sum of Money to the Decimal of a Pound.*

1s. = £$\frac{1}{20}$ = £$\frac{5}{100}$ = £·05.

Hence, to reduce any number of shillings to the decimal of a pound, multiply the number by 5, and cut off two decimal places.

Thus 23 shillings are 1·15 of a pound.
„ 17 „ „ ·85 „

Again, by calculation, we find that a farthing is ·001041$\dot{6}$ of a pound. Now the difference between this decimal and ·001 is ·000041$\dot{6}$, or very nearly ·0000417; and ·001 = $\frac{1}{1000}$. Hence, as far as 3 decimal places are concerned, we may consider one farthing to be $\frac{1}{1000}$th part of a pound; and therefore, in reducing any sum below a certain amount to the decimal of a pound, we need only reduce it to farthings, and mark off three decimal places.

Thus 3¾d. = 15 farthings, and it is therefore ·015 of a pound correctly to three decimal places.

It is evident that when the number of farthings reaches a certain amount, the product of this number by ·0000417, which we neglect, will affect the 3rd decimal place. We will determine the point at which this takes place.

Now (·001 + ·0000417) 23 = ·023 + 0009591 = ·023 to *three* decimal places.
But (·001 + 0000417) 24 = ·024 + ·00100008 = ·025 to *three* decimal places.

Hence, for sums of 24 farthings and upwards, we must *add* one to the number of farthings, and then cut off 3 decimal places as before. This we may do until the number of farthings is large enough to cause more than one to be carried to the 3rd place of decimals.

Thus, 7¾d. = 31 farthings; and therefore, when reduced to the decimal of a pound, it is, correctly to 3 places, ·032.

Now 47 (·0000417) = ·0019599, which still only adds 1 in the 3rd decimal place; and therefore, as far as 48 farthings (one shilling), the above rule holds.

As soon as a shilling is reached, we find the decimal of a pound by the rule first given.

Example.—Reduce 13s. 8½d. to the decimal of a pound.

13s. = £·65 of a pound.
8½d. = 36 farthings = £·037 correctly to 3 places.
Hence 13s. 8½d. = £·687 correctly to 3 places.

Exercise 60.

Find how much the following sums per day amount to in a year:—

1. 2d.
2. 3¼d.
3. 5¾d.
4. 9½d.
5. 1s. 5d.
6. 1s. 1¾d.
7. 1s. 3¼d.
8. 2s. 6d.
9. 2s. 7¾d.
10. 5s.
11. 7s. 3d.
12. 8s. 7¾d.

Reduce to the decimal of a pound correctly to 3 decimal places, by the method of Art. 10:—

13. 3½d.
14. 5¾d.
15. 6d.
16. 2s. 3¾d.
17. 17s. 9¼d.
18. 18s. 9¼d.
19. £3 15s. 8¾d.
20. £15 19s. 11½d.

RULE OF THREE—SINGLE AND DOUBLE.

1. This is a name given to the application of the principles of Simple Proportion to concrete quantities. We have shown (Art. 5, lesson VIII., Vol. II., page 110) that if any three numbers be given, a fourth can always be found such that the four numbers shall be proportionals. Hence, if three concrete quantities be given, two of which are of the same kind, and the third of another kind, a fourth quantity of the same kind as the third can be found such that it shall bear the same ratio to the third quantity as the first two bear to each other; or, what is the same thing, so that the four quantities shall be proportionals.

It is evident, since a concrete quantity can only be compared with another of the same kind (*Obs.* 11, lesson XI., Vol. II., page 289), that the fourth quantity determined must be of the same kind as the third quantity. In order that the ratios of the two pairs of quantities may be equal, either two must be of one kind and two of another, or all four must be of the same kind.

2. Suppose we have the following question proposed:—

Example.—If the rent of 40 acres of land be £95, what will be the rent of 37 acres?

It is evident that the sum required must bear the same ratio to £95 that 37 acres do to 40 acres.

Hence we have, writing the ratios in the form of fractions—

$$\frac{\text{Sum required.}}{\text{£95.}} = \frac{\text{37 acres}}{\text{40 acres}} = \textit{the abstract number } \frac{37}{40}$$

Therefore the sum required = $\frac{37}{40}$ × £95, which can be reduced to pounds, shillings, and pence.

3. The last question might also have been solved thus:—

Since 40 acres cost £95,
1 acre costs £$\frac{95}{40}$;
And therefore 37 acres cost $\frac{37 \times 95}{40}$ pounds.

4. In solving such a question by the Rule of Three, the statement of the proportion is generally written thus:—

acres. acres.
40 : 37 : : £95 : sum required.

Then, by equating the product of the extremes and means, we get the result. We have put the first example, however, in the fractional form, in order to indicate clearly the fact that the ratio of the two quantities of the same kind (acres in this case) is an abstract number, by which the other quantity, the £95, is multiplied. When we state the question in the second way, and talk about multiplying the means and extremes together, some confusion might arise from the idea of multiplying 37 acres by £95. The fact to be borne in mind is that the rule is merely the expression of the fact that the *ratios* of two pairs of quantities are equal.

5. The example we have given is what is called a case of *Direct Proportion*—that is to say, if one quantity were increased, the corresponding quantity of the other kind would be increased. Thus, if the number of acres were increased, the number of pounds they cost would be increased.

If, however, the case be such that, as one of the corresponding quantities be increased, the other is proportionally diminished, the case is one of what is called *Inverse Proportion*. For instance:—

Example.—If 35 men eat a certain quantity of bread in 20 days, how long will it take 50 men to eat it?

Here, evidently, the more men there are, the less time will they take to eat the bread; hence, as the number of men increases, the corresponding quantity of the other kind—viz., the number of days—*decreases*.

Hence, since 50 men are *more* than 35 men, the required number of days will be *fewer* than the 20 days which correspond to the 35 men.

In stating the proportion, therefore, in order to make the ratios equal, if we place the larger of the two terms of one ratio in the first place, we must place the larger of the two terms of the other ratio in the third place.

Thus, placing 50 men in the first place, we must put 20 days (which, we can see, will be larger than the required answer) in the third place, and then the statement would be correctly made thus:—

$$50 : 35 :: 20 \text{ days} \quad \text{required number of days.}$$

Therefore the required number of days $= 20 \times \frac{35}{50}$ days $=$ 14 days.

N.B.—We might reduce the example to a case of Direct Proportion thus, which will, perhaps, explain the above method more clearly:—

35 men eat $\frac{1}{20}$ of the bread in one day.

50 " $\frac{1}{\text{required number of days}}$ " " "

Hence, since the quantity eaten in one day will increase with the number of men, we have—

$$\text{As } 35 : 50 :: \tfrac{1}{20} : \frac{1}{\text{required number of days}};$$

Therefore required time $= 20 \times \frac{35}{50} =$ 14 days, as before.

6. The last question might also have been solved thus:—

35 men eat the quantity in 20 days;

Therefore 1 man eats $\frac{1}{35}$ of the quantity in 20 days.

Therefore 1 man eats $\frac{1}{35 \times 20}$ of the quantity in one day;

Therefore 50 men eat $\frac{50}{20 \times 35}$ of the quantity in one day;

And therefore 50 men would occupy in eating the bread $\dfrac{1}{\frac{50}{20 \times 35}}$, or $\frac{20 \times 35}{50}$ days

N.B.—To get the time occupied in doing a certain work, when the amount done per unit of time (say per day) is given, we must evidently divide the whole quantity of work by the amount done in a day. In the case given above, the bread being considered the unit, $\frac{50}{20 \times 35}$ of the bread is eaten in 1 day, and therefore $\dfrac{1}{\frac{50}{20 \times 35}}$, which is the whole amount eaten divided by the amount eaten in one day, will be the whole time occupied.

7. Hence we get the following statement of *Simple or Single Rule of Three.*

Write down the ratio of the two quantities which are of the same kind, putting the greater in the first place. Then observing from the nature of the question whether the fourth quantity required will be greater or less than the third one which is given, place the greater of the two in the third place of the proportion, and multiply the extremes and means together.

Exercise 61.—Examples in Single Rule of Three.

1. If 16 barrels of flour cost £28, what will 129 cost?
2. If 641 sheep cost £485 15s., what will 75 cost?
3. If £11 5s. buy 63 pounds of tea, how many can be bought for £385?
4. A bankrupt pays 6s. 4d. in the pound: what will be received on a debt of £2,563 10s.?
5. What is £1,460 worth in dollars, allowing 4 dollars 84 cents to a pound, and 100 cents to a dollar?
6. If $\frac{5}{7}$ lb. of snuff cost £$\frac{3}{14}$, what will 150 lb. cost?
7. A man bought $\frac{3}{8}$ of a vessel, and sold $\frac{4}{5}$ of what he bought for £8,240, which was just the cost of it: what was the whole vessel worth?
8. If $\frac{5}{7}$ of a yard cost $\frac{3}{4}$ of a crown, what will $3\frac{3}{4}$ yards cost?
9. If 10 men build a wall in 7 days, how long would it take 24 men to build it?
10. If 6 men build a wall in 15 days, how many men would it take just to finish it in $22\frac{1}{2}$ days?
11. If $\frac{3}{7}$ of a ton cost 9s. $8\frac{1}{4}$d, what would $4\frac{3}{5}$ of a cwt. cost?
12. If a twopenny loaf weighs 1 lb. 2 oz when wheat is 50s. a quarter, what should it weigh when wheat sells for 60s?
13. If the weight of a cubic inch of distilled water be $253\frac{79}{432}$ grains, and a cubic foot of water weighs 1000 oz. avoirdupois, find the number of grains in a pound avoirdupois.

14. If 1 lb. avoirdupois weighs 7,000 grains, and 1 lb troy weighs 5,760 grains, find how many pounds avoirdupois are equal to 175 lb troy.

15. Find the rent of 27a. 3r. 15p. at £1 3s. 6d. per acre.

16. The price of standard silver being 5s. 6d. per ounce, how many shillings are coined out of a pound troy?

17. A bankrupt's assets are £1,500 10s., and he pays 9s. $3\frac{1}{2}$d. in the pound: what are his debts?

18. If standard gold is worth $1\frac{151}{160}$d. per grain, how many sovereigns would be coined out of a pound troy of gold?

19. What is the income of a man who pays 53s. 10d. tax when it is 7d. in the pound?

20. Raising the income-tax 1d. in the pound increases my amount of tax by £2 3s. 4d., and the tax I actually pay is £15 8s. 4d.: what is the rate of the income-tax?

21. A barrel of beer lasts a man and his wife 3 weeks, she drinking half the amount he does: how long would it last 5 such couples?

KEY TO EXERCISES.

EXERCISE 56.

1. £4 17s $3\frac{1}{12}$d
   £3 4s. $10\frac{1}{18}$d.
   £2 4s. $10\frac{17}{36}$d.

2. 6s $10\frac{1}{2}$d.

	lb.	oz.	dwt.	gr.
3.	44	8	5	$10\frac{2}{7}$
	7	8	6	0
	3	8	13	$18\frac{2}{7}$
	1	11	9	$5\frac{7}{16}$
4	51	8	10	$15\frac{3}{4}$
	16	4	19	$9\frac{21}{25}$
	10	6	5	$6\frac{1}{13}$
	5	7	9	$2\frac{12}{73}$
	1	11	8	$23\frac{1}{35}$

5. 46 bush. $8\frac{1}{9}$ qts.
   41 ,, $12\frac{14}{15}$,,
   37 ,, $14\frac{4}{7}$,,
   31 ,, $14\frac{4}{5}$,,
   16 ,, $12\frac{1}{8}$,,
   8 ,, $8\frac{17}{67}$,,

6. 10 yds 3 ft. $1\frac{2}{5}$ in.

7. 9 yds 1 qr. $0\frac{11}{27}$ nls.
   7 ,, 3 ,, $3\frac{13}{68}$,,
   4 ,, 2 ,, $2\frac{11}{54}$,,

	dys	hrs.	min.	sec.
8	24	8	42	40
	7	14	43	20

	yrs.	d.	hr.	m	sec.
9.	10	85	1	13	$11\frac{9}{11}$
	5	308	10	48	$41\frac{11}{19}$
	1	123	9	7	$31\frac{77}{83}$
	1	40	8	32	$8\frac{1}{10}$

10. 1° 48′ $41\frac{1}{5}$″
    1° 17′ 38″
    1° 0′ $22\frac{5}{9}$″

11. 10s. $11\frac{3}{7}$d.

12. $15\frac{135}{161}$.

13. $17\frac{11}{14}\frac{707}{1000}$.

14. $135\frac{18}{1109}$.

15. 137900.

16. 30.

17. 219.

EXERCISE 57.

1. 16s.; 17s. 6d.; $7\frac{1}{2}$d.
2. 5s. 10d.; $5\frac{1}{7}$d.; 3s. 6d.
3. 6 oz. $13\frac{1}{7}$ drms.; 12 dwt. 12 grains; 64 lb.
4. 12 cwt 56 lb.; 2 ft. $4\frac{1}{2}$ in.; 2 yds $2\frac{1}{4}$ in.
5. 4 fur. 97 yds 2 ft. 4 in.; 2 qts. $1\frac{1}{3}$ pts.; $1\frac{2}{3}$ gals.
6. 46 m. 40 sec.; $22\frac{1}{2}$ sec.; 17′ $8\frac{4}{7}$″.
7. 2 m. 2 fur. 211 yds. 2 ft. $6\frac{2}{3}$ in.; 3 d. 19 hrs.
8. £4 16s.; 2s. $0\frac{1}{2}$d. $\frac{2}{31}$f.
9. 1s. 6d.
10. £88.
11. £2.
12. £1.
13. 12s. 9d.
14. 15s. 10d.
15. 11s. $0\frac{4}{65}$d.
16. $\frac{7}{30}$; $\frac{11}{48}$; $\frac{221}{480}$.
17. $\frac{198}{320}$; $\frac{7}{480}$; $3\frac{757}{900}$
18. $\frac{7}{1920}$.
19. $\frac{7}{15}$.
20. $\frac{1}{5}$.
21. $\frac{1}{8004500}$.
22. $\frac{8745}{8884}$.
23. 1.
24. $\frac{1745}{4810}$.
25. $\frac{451}{334500}$.
26. $.\frac{9}{8}$.
27. $\frac{80}{189}$.
28. 2088 minutes.
29. $\frac{7}{10}$.
30. $\frac{19}{80}$.
31. £9 12s.
32. 385160 square feet.
33. 61 yds. 2 ft. 4 in.

EXERCISE 58.

N.B.—The fractional parts of a farthing are neglected in these results.

	£	s.	d.		£	s.	d.		£	s.	d.
1.	220	1	$0\frac{1}{2}$	9.	5875	0	0	17.	865	4	$7\frac{1}{4}$
2.	1625	9	9	10.	12951	18	9	18.	1358	0	$6\frac{1}{2}$
3.	212	4	4	11.	818	1	$7\frac{3}{4}$	19.	1810	8	$8\frac{1}{4}$
4.	411	18	$10\frac{1}{2}$	12.	691	0	10	20.	144	7	$8\frac{3}{4}$
5.	2290	6	0	13.	962	18	2	21.	1895	0	$11\frac{3}{4}$
6	185	12	8	14.	214	5	$5\frac{1}{2}$	22.	163	9	0
7.	78742	2	6	15.	888	8	1	23.	2226	8	$5\frac{3}{4}$
8.	3456	16	8	16.	569	6	$3\frac{1}{2}$				

GEOGRAPHY.—XII.

[*Continued from p.* 316.]

EUROPE.

The continent or mainland of Europe is divided politically between eighteen states; which, with their areas, ratios to Great Britain, and populations, are given in the following table:—

	Area in sq. miles.	Ratio to Great Britain.	Population.	Density per sq. mile.
Six Central States:				
France - - - -	204,117	$2\frac{1}{3}$	38,218,903	187
Belgium - - - -	11,373	$\frac{1}{8}$	5,974,743	543
Holland - - - -	12,680	$\frac{1}{7}$	4,390,857	365
Germany - - -	211,196	$2\frac{1}{3}$	46,855,704	222
Switzerland - -	15,981	$\frac{1}{5}$	2,940,602	188
Austria-Hungary -	261,649	3	41,056,206	157
Three Northern States:				
Norway & Sweden	295,714	$3\frac{1}{3}$	6,659,901	$22\frac{1}{2}$
Denmark - - -	14,789	$\frac{1}{6}$	2,130,100	145
Russia - - - -	2,081,022	$23\frac{1}{2}$	87,438,572	42
Nine Southern States:				
Spain - - - - -	196,173	2	17,268,600	88
Portugal - - - -	34,606	$\frac{2}{5}$	4,306,554	$124\frac{1}{2}$
Italy - - - - -	114,410	$1\frac{1}{4}$	29,943,607	$262\frac{1}{2}$
Roumania - - -	48,307	$\frac{1}{2}$	5,376,000	112
Servia - - - -	18,757	$\frac{1}{4}$	1,973,060	$105\frac{1}{2}$
Bulgaria - - - -	38,562	$\frac{5}{11}$	2,984,019	$77\frac{1}{2}$
Montenegro - -	3,486	$\frac{1}{25}$	220,000	63
Turkey - - - -	66,500	$\frac{3}{4}$	4,668,000	70
Greece - - - -	24,977	$\frac{2}{7}$	1,979,453	$79\frac{1}{2}$

FRANCE.

Position and Boundaries.—France, the western state of Central Europe, lies between 4° 45′ W. and 7° 45′ E. long., and between 42° 20′ and 51° 5′ N. lat.; its northern limit being approximately on the latitude of Dover and Leipzig, its southern on that of Boston, and its western on the meridian of Glasgow. Its central meridian is nearly that of Paris, 2° 20′ E. of Greenwich, and its central parallel, 47° N., is nearly that of Quebec. It is bounded on the north by the English Channel (*La Manche*), the Straits of Dover (*Pas de Calais*), and Belgium (*Belgique*); on the east by Lothringen (*Lorraine*) and Elsass (*Alsace*)—separated by the Vosges Mountains and belonging to Germany (*Allemagne*)—by Switzerland (*Suisse*), separated by the Jura, and by Italy (*Italie*), separated by the Alps; on the south by the Mediterranean Sea and the Pyrenees, separating it from Spain (*Espagne*); and on the west by the Bay of Biscay.

Form, Dimensions, and Coast-line.—France forms a five-sided figure, about 600 miles both in length and breadth, with an area, including Corsica, of 204,117 square miles, or four times that of England. Its circumference is about 3,000 miles, half of which is sea-coast, giving one mile to every 136 square miles of area. From *Cape Gris Nez*, on the north, opposite Hythe in Kent, to the mouth of the Seine, opposite Brighton, the coast is varied, with chalk cliffs. Then comes the *Cotentin Peninsula*, with its *Capes Barfleur* and *La Hague*, with the port of *Cherbourg*, and to the west the Channel Islands. The coast then becomes rugged and granitic round Brittany to the mouth of the Loire, with the harbour of *Brest* on the north-west. The remainder of the west coast is low, with shallow lagoons producing salt, and—south of the estuary of the Gironde—sand-dunes, now planted with pines. Off the coast are the small islands of *Ushant* (d'Ouessan), in the north-west, *Belle Isle*, *Ré*, and *Oléron*. The south coast sweeps from the Pyrenees round the Gulf of the Lion to the mouths of the Rhone, and has eastwards the *Hyères* Islands, from which runs the steep cliff-line of the *Riviera*, facing south-east.

Surface and Drainage.—France consists, roughly speaking, of mountains to the east and south, and a south-eastern plateau sloping north-westward and westward into plains only interrupted by the highlands of Brittany and of the west of Normandy. The northern slope of the *Pyrenees* is by far the steeper, though the chief summits happen to be in Spanish territory. The *Maritime Alps*, traversed by the pass of the *Col di Tenda*, extend from the coast at Mentone to the *Cottian Alps*, in which is the *Mont Cenis Pass*, between the valleys of the Isère and Po, now pierced by a tunnel and guarded by the fortress of Grenoble. The *Graian Alps* sweep round Savoy to *Mont Blanc*, 15,780 feet, or nearly three miles high, The *Rhone* (530 miles), which rises in Switzerland, flowing through the *Lake of Geneva* (260 square miles), the south shore of which is French, divides the Alpine system from the far lower *Jura*. Flowing southward and westward to Lyons, it receives the *Saône* from the *Vosges*, the tributary *Doubs* draining the west side of the Jura. From Lyons southward to Arles, where, after receiving the *Isère* and *Durance* from the Alps, it divides into several channels. The Rhone divides the Alpine plateau from the *Cevennes*. This range, reaching 4,887 feet in *Mont Lozère* and 5,820 feet in *Mont Mezene*, slopes westward, and is drained by the Garonne, Loire, and Seine. The *Garonne* (350 miles) rises in the Pyrenees, receives the *Tarn* and the *Lot* from the south-west of the Cevennes, and the *Dordogne* from Auvergne, and forms the estuary of the *Gironde*. Its basin above Toulouse is connected with the Mediterranean at Cette by the *Canal du Midi*, the summit-level of which is a little more than 600 feet above the sea. The *Loire* (600 miles), the chief river of France, navigable for over 500 miles, rises in the Cevennes and flows north and then west into the Bay of Biscay, receiving on its left bank the *Allier* from the Cevennes and the *Cher* and *Vienne* from Auvergne. Between the valleys of the Allier and the Dordogne are the *Mountains of Auvergne*, an interesting volcanic group, including *Puy de Dôme*, 4,806 feet, and *Mont Dore*, 6,188 feet. The basin of the Loire is connected with that of the Saône by the *Canal du Centre*, which ascends to 1,000 feet above sea-level. The *Seine* (450 miles) rises in the *Plateau of Langres* and flows north-westward into the English Channel, receiving on its left bank the *Yonne*, and on its right the *Marne* from the Vosges Mountains and the *Oise* from the Ardennes. The Yonne is connected with the Saône and Doubs by the *Canal de Bourgogne*, with a summit-level of 1,200 feet. Between the Canal du Centre and this canal are the highlands of the *Côte d'Or* ("Gold Coast"), so called from the rich vineyards on their Burgundian or eastern slope, which faces the Saône. To the north of this ridge lies the *Plateau of Langres*, which joins the *Vosges* Mountains. Another canal joins the Doubs near Montbéliard with the Rhine at Strassburg (French, Strasbourg), passing, at a level of 1,150 feet, through the *Burgundy Gate* between the Jura and the Vosges. On the north-west slopes of the latter chain rise the *Moselle*, with its tributary the *Meurthe*, and the *Meuse*, both tributaries of the Rhine. Separating the valley of the latter from that of the Oise is the high ground of the *Ardennes*, once a vast forest. In the north of France is the small valley of the *Somme;* between the Loire and Gironde that of the *Charente;* and in the south-west that of the *Adour*.

Climate, Soil, and Productions.—The north of France has a climate like the south of England, with fine pastures, corn land, and apple orchards; but, whilst the Atlantic gives Brittany a winter mild enough for sub-tropical plants, the interior has a far more extreme climate. Paris has an average summer temperature of 62° F., two degrees warmer than London, and a winter temperature of 36° F., two degrees colder than London; whilst in Champagne, though grapes ripen in summer, the winters are fatal to holly and other evergreens. The vine is generally cultivated south-east of a line from the mouth of the Loire to Mezieres in the Ardennes; the sugar-beet, north of this line; maize, south-east of one from Bordeaux to Strassburg; and olives, mulberries, and oranges, in the south-east. The soil of the plains is generally fertile; but the Auvergne Mountains, and much of the central plateau and the flat coast south of the Gironde, are unproductive. The mineral resources of France are not great. There are two chief coal-fields—that of Belgium, extending into the Department *du Nord*, and that of St. Étienne, in the centre. The annual produce is nearly 20 million tons. Iron occurs in these districts and elsewhere, 1½ million tons being smelted annually. Forests occupy nearly a sixth of the surface, oak and beech prevailing in the north-east, silver fir and larch in the east, cluster-pine on the dunes of the Landes, and the chestnut and cork-oak in the south. The anchovy fishery, in the Mediterranean, and oysters, sardines, and pilchards, in Brittany, are important. Among wild animals, the wolves in the forests and the chamois in the Alps and Pyrenees are noteworthy. The silkworm is largely reared in the south, and much honey is made at *Narbonne*.

Population and Industries.—The population of 38 millions—or 187 to the square mile—is mainly of Celtic race, though the country is named from a tribe of Teutonic invaders, and the language is of Latin origin. Among the more striking national characteristics are liveliness, wit, love of pleasure, artistic taste, personal bravery, love of glory, and thrift often resulting in avarice. Agriculture and the manufactures dependent on it employ three-fourths of the people, woollens, wine, spirits, and silks being the chief exports. Beetroot sugar, butter, eggs, and fruit are largely exported to England. Wool is chiefly manufactured at *Roubaix*, *Reims*, and *Amiens;* the chief wine-growing districts are the valley of the Garonne, Champagne, and Burgundy, over 600 million gallons being produced annually; and *Lyons* (Lyon) is the centre of the silk and velvet manufacture. *Paris* is the centre of the manufacture of kid gloves, clocks and watches, mirrors, artificial flowers, and porcelain; *Lille* of the linen trade; *Rouen* of the cotton manufacture; and *St. Étienne* of the iron trade. The imports are chiefly food and raw materials, including cereals, more wine than is exported, wool, raw silk, timber, cotton, and coal. One-fifth of the entire trade is with England. The chief ports are *Calais*, *Boulogne*, and *Dieppe*, packet-stations for England; *Havre*, trading with America; *Bordeaux*, exporting wine; and *Marseilles*, trading with the Mediterranean and the East Indies.

Inland Communication.—Besides the rivers and canals, which are of great importance, France is well supplied with railways, which revert in time to the State. Nearly 30,000 miles are now open, The chief lines radiate from Paris, other centres being *Lille* in the north, *Tours*, whence branches go to Nantes and Bordeaux, *Dijon* and *Lyons*, whence the line passes to Grenoble and Mont Cenis.

Government, &c.—The government is republican, with a president elected for seven years by the Senate and Chamber of Deputies, the 300 members of the former body holding office partly for life and the rest for nine years, and the 557 deputies being elected by universal suffrage. There is also a responsible ministry. The annual revenue exceeds 152 millions sterling; but the national debt is the largest in the world, amounting to 1,440 millions. The standing army exceeds half a million men, and on a war footing numbers nearly 1,400,000. The navy consists of 400 vessels, one-tenth of which are ironclads.

Education and Religion.—Though neither gratuitous nor compulsory, primary education is well provided for, and a thoroughly organised system of state-supported secondary, higher, and technical education exists. Twenty towns have faculties; but the University of Paris alone confers degrees in all five—theology, law, medicine, science, and literature. All religions are legally equal, but the vast majority of the population are Roman Catholics.

Divisions and Chief Towns.—France is divided into 87 departments, these being subdivided into arrondissements, cantons, and communes. Beginning in the north-east the chief towns are:—

Dunkirk [35], a fortified port. *Lille* [160], fortified, manufacturing cotton and linen. *Roubaix* [75], woollen manufacture. *Tourcoing* [33], carpet and curtain manufacture. *Valenciennes* [23], fortified, lace. *Cambrai*, cambric. *Calais* [23], the nearest port to England, 24¾ miles from Dover. *Boulogne* [22], 29 miles from Folkestone. *Creçy* and *Agincourt*, battlefields of 1346 and 1415. *Amiens*, on the Somme, wool manufacture. *Dieppe*, 64 miles from Newhaven. *Havre* [86], or *Le Havre* ("the harbour"), at the mouth of the Seine, 122 miles from Southampton, importing cotton from America. *Rouen* [106], higher up the Seine, cotton manufactures. **Paris** [2,345], the capital, on the Seine, 100 miles from its mouth, is 267 miles, or about 10 hours, distant from London. Second in population to London alone, fortified, with a cathedral (Nôtre Dame), university, and manufactures of clocks and fancy goods, etc. It is in long. 2° 20′ E., so is 10 minutes fast by Greenwich, and in lat. 48° 50′ N. *Versailles* [50], with a palace. *Reims* [80] and *Epernay*, centres of the champagne trade. *Nancy* [66], cloth and muslin trade. *Cherbourg* [36], on the Cotentin peninsula, 68 miles from Weymouth, and *Brest* [67], in Finistère ("Land's End"), the westernmost department, are fortified naval stations. *Nantes* [120], and its port *St. Nazaire*, on the Loire. *Angers* [55], on the Mayenne, with slate quarries. *Tours* [48], with silk manufacture, and *Orléans* [50], an important railway centre, both on the Loire. *Dijon* [45], the centre of the Burgundy wine-trade. *Lyon* (Lyons) [340], the second city in France, at the confluence of the Rhone and Saône, the centre of the silk and velvet trade. *St. Étienne* [120], with extensive coal-mines and iron-works. *Bordeaux* [212], on the Garonne, the port of the claret district. *Toulouse* [130], at the junction of the same river with the Canal du Midi, and *Cette* [28], at the outlet of the canal. *Nîmes* [61], and *Avignon* [33], once a Papal city, manufacturing silk. *Marseilles* [320], the chief port and third city of France, founded B.C. 500. *Toulon* [61], a strongly fortified naval station. *Cannes*, *Nice* [46], the nominally independent *Monaco*, and *Mentone*, health resorts, on the Riviera.

CORSICA (Fr., *Corse*), a mountainous island of 3,377 square miles, the capital of which is *Ajaccio*, the birthplace of Napoleon I., is a department of France, though the people speak Italian.

Foreign Possessions.—In Africa, ALGERIA, 123,000 square miles, with 3,800,000 population, capital **Algiers** [70], 1,390 miles from London, 38 hours from Marseilles, producing alfa grass; SENEGAL, comprising 97,000 square miles, extending as far as the River Niger, with a population of 1½ million; ASSINI and GRAND BASSAM, on the Ivory Coast; the mouth of the GABOON and Ogowe, with some stations nearer to the Congo, 174,340 square miles, with 1,700,000 inhabitants; OBOKH and the GULF OF TAJURA, on the Gulf of Aden; the COMORO ISLANDS, MAYOTTE, and NOSSIBÉ, in the Mozambique Channel; and ST. MARIE and RÉUNION, formerly Bourbon, to the east of Madagascar. In Asia, France holds PONDICHERRY, CHANDERNAGORE, YANAON, KARIKAL, and MAHÉ in India; TONGKING, 35,000 square miles, with 9 million inhabitants, capital **Hué**, and COCHIN CHINA, 23,000, with over 1½ million, the delta of the Mekong, producing rice, capital **Saigon**. In Australasia, she holds NEW CALEDONIA, capital **Numea**, a penal settlement; the LOYALTY, MARQUESAS, GAMBIER, AUSTRAL, and SOCIETY ISLANDS, of which the chief is *Tahiti* or *Otaheite*, "the gem of the Pacific." The New Hebrides are under an Anglo-French dual protectorate. In America France possesses the islands of ST. PIERRE and MIQUELON, off the coast of Newfoundland; MARTINIQUE and GUADELOUPE, in the West Indies; and CAYENNE, or French Guiana, 46,880 square miles, with 36,000 inhabitants, on the mainland of South America, adjoining Brazil. Besides these possessions France exercises a protectorate over TUNIS, in North Africa, east of Algeria, 45,000 square miles, with 1½ million inhabitants, capital **Tunis** [145], near which is the site of *Carthage;* over the island of MADAGASCAR, 228,000 square miles, with a population of 4 millions, capital **Antananarivo** [80]; and over ANAM, 106,000 square miles, with 6 millions, and CAMBODIA, 32,000 square miles, with 1½ million inhabitants, in Further India. The total area of French dependencies is about 932,500 square miles, with nearly 31 million inhabitants, of whom only half a million are of French birth.

BELGIUM.

Physical Characters.—With a coast-line of only 41 miles on the North Sea, Belgium is separated from France on the south, from Dutch Luxemburg and Rhenish Prussia on the east, and from the Netherlands on the north by somewhat artificial boundary-lines. It lies between lat. 49° 30′ and 51° 30′ N. and between long. 2° 30′ and 6° 8′ E., and has an area of 11, 373 square miles, *i.e.*, is not quite twice as large as Yorkshire. The south-east part of the plateau of the Ardennes reaches an altitude of over 2,000 feet, has a poor soil, but is bounded by the rich coal-field of Mons, Namur, and Liège, in the valley of the Meuse and its tributary the Sambre; but the rest of the country is low, flat, and, owing to good cultivation, very productive. The chief rivers, the *Meuse*, *Sambre*, and *Escaut* (Scheldt), enter the country from France, flowing north-eastwards and then turning north-westwards. Near the coast there are "polders," low-lying tracts protected by dykes or artificial embankments.

Population and Industries. — The population, numbering about 6 millions, or over 500 to the square mile, is denser than in any other country. More than half are of Teutonic race, speaking Flemish, the rest, known as Walloons, mainly in the south, speaking French. Forests occupy 17 per cent. of its area; but most of the country is under tillage in small farms, corn, beetroot sugar, flax, eggs, butter, rabbits, and hops being exported. Belgium is, however, essentially a manufacturing country, importing much of its food-supply. The chief manufactures are cotton, linen, woollen, machinery, hardware, steel, glass, beet-sugar, silk, lace, gloves, paper, and beer. The annual exports exceed 106 millions sterling. Besides 2,740 miles of railway there are 560 miles of canals.

Government, Education, &c. — Government is vested in an hereditary king and elective senate and chamber of representatives. There is no navy, but the army, service in which is compulsory, numbers 48,000. The revenue is 13 millions, the public debt 87 millions, sterling. The people are Roman Catholics, and elementary education is compulsory. There are universities at Brussels, Louvain, Liège, and Ghent, a famous Conservatoire of Music at Brussels, and an Academy of Art at Antwerp.

Chief Towns.—**Brussels** (*Bruxelles*) [448], on the Senne, a tributary of the Scheldt, 224 miles, or 10 hours, from London, in long. 4° 21′ E., and so 17 minutes fast by Greenwich, nearly in the centre of the country, with manufactures of carpets and lace. Nine miles south is *Waterloo*. *Antwerp* (*Anvers*)

[210], on the Scheldt, an ancient well situated port, 210 miles from London, 140 from Harwich, strongly fortified. Cathedral, with paintings by Rubens. *Ghent* (*Gand*) [147], on the Scheldt, manufacturing cotton. *Liège* (*Luttich*) [140], on the Meuse, in the east, manufacturing fire-arms and machinery. *Ostend*, on the coast, 68 miles from Dover, packet-station. Belgium has no colonies, but the King of Belgium is "Sovereign" of the Congo Free State in Africa.

LATIN.—XII.

[*Continued from p. 278.*]

AGREEMENT (*continued*).

Now take as an instance the sentence *mors omnium rerum est extremum* (death is the end of all things). Here *mors*, the subject, is in the feminine gender, and *extremum*, the predicate, in the neuter. The rule, therefore, seems to be broken. But the fact is, that in this and similar cases the neuter adjective denoting a being or thing of a certain class may be looked upon as a substantive, and is to be construed as such. This construction, it may also be noticed, is very frequent in Greek. Other examples are given here :—

"Turpe senex miles, turpe senilis amor."—*Ovid.*
An old man a soldier is unseemly; unseemly is an old man's love.

"Varium et mutabile semper (est) femina."—*Virgil.*
Woman is always a varying and changeful thing.

In such a phrase as the following, *Excisa ferro est Pergamum* (Pergamum has been razed by the sword), *excisa* is feminine, because it agrees with *urbs* (city), which is implied in *Pergamum*, though *Pergamum* is of the neuter gender. The explanation of this may be sought in the fact that the construction follows the sense of the passage rather than the grammatical form. Similarly we may explain *Eunuchus bis die acta est* (Eunuchus was acted twice in a day). Here *fabula* or *comedia* is implied in *Eunuchus*, Eunuchus being the name of one of the favourite Roman comedies.

In the sentence *Athenæ fuerunt urbs* (Athens was a city), *Athens* is in the Latin of the plural number, and *urbs* of the singular. Here the form is regarded more than the sense of the word; for *Athenæ*, though plural in form, is singular in meaning. In this sentence—

Amantium iræ amoris integratio est;
Lovers' quarrels are the restoration of love;

the copulative verb (*est*) agrees with the predicate, not the subject. It often happens that the verb in such cases agrees with the word which is nearest. In these two sentences then—

1. Athenæ fuerunt urbs;
2. Amantium iræ amoris integratio est;

we find the subjects and the copulæ of different numbers. The general rule in such cases is that the verb should agree with the subject; accordingly, in the first sentence, *fuerunt* is connected with *Athenæ*; but in the second sentence the subject *iræ* is plural, whereas the verb *est* is singular. This is a case of attraction; *est* is made singular by the proximity of the singular noun *integratio*.

2. **A pronoun agrees with a noun,** as :—

1. Trucidate *eum*, patriæ *proditorem.*
   Slay him, the betrayer of his country.
2. *Vos, Quirites,* veneramini Jovem.
   You, O Quirites, venerate Jupiter.
3. *Meus frater* est diligens.
   My brother is industrious.
4. Quæ *ego consul* dixi vera sunt.
   The things are true which I said when I was consul.

In the first sentence the pronoun *eum* agrees with the noun to which it refers in gender, number, and case, both being in the masculine gender, the singular number, and the accusative case. The same agreement may be observed in the second. In the third sentence the possessive pronoun *meus*, like other adjectives, agrees with its noun *frater* in gender, number, and case, both being in the masculine gender, singular number, and nominative case. In the fourth sentence the noun *consul* agrees with the pronoun *ego* in gender, number, and case, both being in the masculine gender, singular number, and nominative case. From these instances we may deduce the rule that

A pronoun agrees with a noun in gender, number, and case.

The pronoun may be implied, as—

Hostis hostem occidere volui.
(I) an enemy wished to kill an enemy.

Hostis is the first person singular, in apposition with the pronoun *ego* implied in *volui*, a verb of the first person singular, perfect tense.

We may remark incidentally that the pronoun *ille* is used to mark out a person or thing emphatically, and generally in a good sense; *iste*, employed also for emphasis, conveys reproach, as—

Magno *illi* Alexandro est simillimus.
He is very like THE CELEBRATED *Alexander the Great.*
Non erit *ista* amicitia sed mercatura.
THAT *would not be friendship but traffic.*

Observe that in the last example *ista* agrees with *amicitia*, though in most similar cases the pronoun is in the neuter gender. The general fact may be stated thus, that *pronouns referring to something gone before agree with the noun to which they are prefixed;* what has gone before may be a sentence, or a statement, or a fact, or even a noun, as—

Pompeio, quod populi Romani *lumen* fuit, extincto
Pompey, who was the light of the Roman people, being dead.

We give some instances of the agreement between nouns and pronouns which it will be worth while to study carefully:—

1. *Hæc* est nobilis ad Trasimenum *pugna.*
   This is the famous battle near Trasimenum.
2. *Qui cantus* dulcior inveniri potest?
   What sweeter song can be found?
3. *Quod carmen* est aptius?
   What verse is more suitable?
4. *Quæ virgo* est pulchrior?
   Which virgin is more beautiful?
5. *Coloniam quam* Fregellas appellant
   The colony which they call Fregellæ.
6. *Libri quos* ad te misi optimi sunt.
   The books which I have sent to thee are very good.
7. Est mihi *filius quem* valde amo.
   I have a son whom I greatly love.
8. Optima est *filia* tua, mater, *eam* diligas.
   Thy daughter is excellent, O mother, love her.

With regard to the relative the general rule may be given thus:—*The relative pronoun agrees with its antecedent in gender and number.* The antecedent is the word, noun, or pronoun which goes before, and to which in sense the relative refers. In the fifth sentence above, *coloniam* is the antecedent to *quam;* and in the sixth *libri* is the antecedent to *quos.* A proposition may be the antecedent, as—

Ego cum Pompeio in sermonibus versatus sum; *quæ* nec possunt scribi nec scribenda sunt.
I have discoursed with Pompey; which things (that is, the things which were then spoken) *neither can be written nor must be written.*

When the reference is made to a fact, the neuter *quod* is used commonly, having *id* before it, as—

Timoleon, id quod difficilius putatur, multo sapientius tulit secundam quam adversam fortunam.
Timoleon bore good fortune much more wisely than bad, a thing (that is, to do so) *which is thought more difficult* (that is, *it is thought more difficult to bear good fortune wisely than bad fortune*).

The rule in regard to gender is sometimes transgressed in cases of attraction, as in the example given at the top of this page. In point of place, the relative is often put before the noun to which it refers, as in the following very rare construction, where *herbas* is attracted into the case of the relative:—

Cecidere manu, *quas* legerat *herbas.*
The herbs which she had gathered fell from her hands.

A similar attraction is seen in the following sentence:—

Quos cum Matio pueros miseram epistolam mihi attulerunt;
Those slaves whom I had sent with Matius brought the letter to me;

where observe the marked difference of idiom; for *boys,* which is in the nominative case, and forms a part of the subject in English, is in Latin (*pueros*) in the accusative case, and forms part of the object.

The demonstrative pronoun is added to the relative for the sake of emphasis, as—

Quam quisque novit artem, *in hâc* se exerceat.
Let each exercise himself in that art with which he is acquainted.

The antecedent noun is sometimes repeated with the relative. Cæsar is fond of this construction:—

Erant omnino itinera duo, *quibus itineribus* domo exire possent.
There were in all two roads, by which roads they were able to quit their home.

Sometimes a demonstrative pronoun is implied in the relative, as, *quæ tua est prudentia,* which is equivalent to *ea prudentia, quæ tua est; quâ tu es prudentiâ,* for *prudentia quâ es:*—

Quâ es prudentiâ, nihil te fugiet.
Such is your forethought, nothing will escape your notice.

3. **A pronoun may agree with a pronoun:** for example:—

Caveto ne *alios* vituperes, *qui* fortasse laude digniores sunt quam *tu ipse.*
Take care you do not blame others who perhaps are more worthy of praise than you yourself.

Here the relative *qui* agrees with its antecedent, the pronoun *alios,* in gender and number; and *ipse* agrees with *tu* in gender, number, and case, being in the nominative case, singular number, and masculine gender.

The rule may be stated thus:—

Pronouns agree with pronouns in gender and number, or *in gender, number, and case.*

4. **An adjective or participle agrees with a noun:** for example:—

1. *Adjective. Patria* Ciceroni *carissima* est.
   His country was most dear to Cicero.
2. *Participle. Carthago deleta* est.
   Carthage has been destroyed.

In the first instance the adjective *carissima* is in the same gender, number, and case as the noun *patria.* In the second instance the participle *deleta* is in the nominative case, singular number, and feminine gender, because *Carthago* is in the nominative case, singular number, and feminine gender.

The rule, then, is—

An adjective or participle agrees with a noun in gender, number, and case.

If the subject consists of more than one noun, the attributives (the adjective or participle) are generally, together with the verb, in the plural number, as—

Pater et filius *mortui* sunt.
The father and the son are dead (*have died*).

If the subject contains nouns of different genders—for instance, one masculine and one feminine—then the masculine generally has the predicate to be in the masculine, as—

> Pater mihi et mater *mortui* sunt.
> *My father and mother are dead.*

The gender is in some cases however determined by attraction, the noun nearest the adjective or participle attracting or drawing the adjective or participle into its gender, as—

> *Convicta* est *Messalina* et Silius.
> *Messalina was convicted and Silius.*

This construction may be explained by the supposition that the predicate agrees in reality with the nearest noun only, and is to be considered as repeated after the second noun, thus:—

> Convicta est Messalina, et Silius convictus est.
> *Messalina was convicted, and Silius was convicted.*

When a number of nouns in the subject represent things, the predicate is neuter, though one or more of the nouns may be masculine or feminine, as—

> Secundæ res, honores, imperia, victoriæ, *fortuita sunt.*
> *Prosperity, honours, commands, victories, are gifts of fortune.*

Here the subject contains one masculine noun, ***honores***, and two feminine nouns, ***secundæ res*** and ***victoriæ***, yet the predicate is in the neuter gender, ***fortuita***. A single masculine noun, however, requires the adjectives or participle to be in the masculine gender. The gender may also be determined by proximity, that is, by the gender of the nearest noun.

When the subject, though in the feminine or neuter gender, denotes male persons, then the construction, being determined by the sense rather than the sound, sometimes requires the predicate to be in the masculine, as—

> *Capita* conjurationis *percussi* sunt.
> *The heads of the conspiracy were punished with death.*

5. **A verb agrees with its subject,** as, for example, in the following sentences—

1. Nauta navigat, *a sailor sails.*
2. Nautæ navigant, *sailors sail.*
3. Tu nauta navigas, *thou sailor sailest.*
4. Vos nautæ navigatis, nos nautæ navigamus, *you sailors sail, we sailors sail.*

Here it is seen that the noun agrees with its verb in number only. Those pronouns, however, which are termed personal, agree with their verbs in number and person.

A noun in the singular number must have the verb in the singular number. A pronoun of the first person must have the verb in the first person. A pronoun in the second person must have the verb in the second person. A pronoun in the third person must have the verb in the third person. These statements may be generalised into the rule—

A finite verb agrees with its subject in number and (when its subject is a pronoun) in person.

The subject may be either simple or compound. A simple subject consists of one noun. A simple subject having its noun in the singular requires the verb to be in the singular. A simple subject having its noun in the plural requires the verb to be in the plural. Some nouns, though singular in form, have a plural signification; a simple subject consisting of one such noun is sometimes constructed with a plural verb.

Nouns which, being singular in form, have a plural signification, are called *nouns of multitude*, because they denote many objects. They are also termed *collective* nouns: for example—

> Magna multitudo convenerant.
> *A great multitude had assembled.*

A *collective* noun may be viewed in two lights: either in relation to the individual objects which separately enter into it, or in relation to the one whole which these individual objects unitedly form. In the former case collective nouns obviously have a plural import, consequently they have a plural construction; in the latter case, collective nouns present a single idea or conception, and therefore take a verb in the singular. Whichever of these two states, singular or plural, is prominent in the mind, that determines the number of the verb. It is possible, in regard to the same object, that the two states may succeed each other, an object being conceived of first as plural and then as singular. Accordingly, the same subject may have a plural verb and a singular verb, as—

> Pars major *receperunt* sese, pars *perstitit* ad vallum.
> *The greater part fled, a part stood firm at the fosse.*

In this sentence, Livy, by the judicious use of the plural and the singular verb, has painted first the scattered fugitives, and secondly the dense phalanx of the band which kept its post.

In the example just given the plural verb precedes the singular. The reverse may be the case: for example—

> Pars *stupet* innuptæ donum exitiale Minervæ,
> *Et molem mirantur equi.*
> *A part is astounded at the destructive gift of the virgin-goddess Minerva.*
> *And admire the huge size of the horse.*

Here the singular form of ***pars*** puts the verb which immediately precedes into the singular number. At the end of the sentence the writer's mind was free from the influence of that form, and thinking of the gazing Trojans as individuals, he naturally employed a plural verb.

The principles here laid down may, as principles, be considered applicable to the English language, though in details they may in such application require some modification. For instance, *pars*, and similar nouns (turba, vis, multitudo, exercitus, juventas, nobilitas, gens, plebs, vulgus) in Livy, are constructed with a verb in the singular, thus corresponding with our English usage; but in the above passage from Vergil, *pars* has after it ***stupet***, a singular form, and finds in the rendering ***is astounded*** a translation which offends our English grammatical sense.

TRANSLATION.

Ovid: "Dido to Aeneas" *(continued)*.

"Quo fugis? obstat hiems; hiemis mihi gratia prosit,
Aspice ut eversas concitet Eurus aquas.
Quod tibi maluerim, sine me debere procellis:
Justior est animo ventus et unda tuo.
Non ego sum tanti (quamvis merearis, inique!)
Ut pereas, dum me per freta longa fugis.
Exerces pretiosa odia, et constantia magno,
Si, dum me careas, est tibi vile mori.
Jam venti ponent, strataque aequaliter unda
Caeruleis Triton per mare curret equis.
Tu quoque cum ventis utinam mutabilis esses!
Et, nisi duritia robora vincis, eris.
Quid si nescires, insana quid aequora possint?
Expertae toties tam male credis aquae?
Ut pelago suadente etiam retinacula solvas,
Multa tamen latus tristia pontus habet.
Nec violasse fidem tentantibus aequora prodest:
Perfidiae poenas exigit ille locus:
Praecipue cum laesus Amor; quia mater Amoris
Nuda Cytheriacis edita fertur aquis.
Perdita ne perdam timeo, noceamve nocenti;
Neu bibat aequoreas naufragus hostis aquas.
Vive, precor; sic te melius, quam funere, perdam.
Tu potius leti causa ferare mei.
Finge, age, te rapido (nullum sit in omine pondus)
Turbine deprendi: quid tibi mentis erit?
Protinus occurrent falsae perjuria linguae,
Et Phrygia Dido fraude coacta mori.
Conjugis ante oculos deceptae stabit imago
Tristis, et effusis sanguinolenta comis.
Quicquid id est, totum merui, concedite; dicas;
Quaeque cadent, in te fulmina missa putes.
Da breve saevitiae spatium pelagique tuaeque:
Grande morae pretium tuta futura via est.
Nec mihi parcatur; puero parcatur Iulo.
Te satis est titulum mortis habere meae.
Quid puer Ascanius? quid Di meruere Penates?
Ignibus ereptos obruet unda Deos.
Sed neque fers tecum; nec, quae mihi, perfide jactas,
Presserunt humeros sacra paterque tuos.
Omnia mentiris: nec enim tua fallere lingua
Incipit a nobis; primaque plector ego.
Si quaeras, ubi sit formosi mater Iuli;
Occidit, a duro sola relicta viro.
Nec mihi mens dubia est, quin te tua numina damnent;
Per mare, per terras, septima jactat hiems."

NOTES.

1. *Gratia.* "The kindly influence."

Ut. "How." This particle depending on a verb takes the subjunctive.

3. *Sine.* Imperative of *sino.* "Let me owe to the storms what I had rather owe to you."

5. *Tanti.* This is called by grammarians the genitive of "price." "I am not worth so much."

Ut pereas. "That you should perish"—*i.e.*, by shipwreck.

7. *Pretiosa odia, et constantia magno.* The emphasis of the sentence is upon *pretiosa* and *constantia magno*, which mean almost the same thing. Translate the line thus: "The feelings of hatred that you encourage are dearly bought, and cost a high price."

8. *Me.* The ablative after a verb of want. The general sense of lines 7 and 8 is this, "Your hatred will cost you dear if, so long as you get rid of me, you regard death as nothing."

Ponent. This is a transitive verb used intransitively; "the winds will calm (themselves)." So Vergil writes *cum posuere venti*, "when the winds have fallen, *or* become calm."

9. *Strata.* The past participle passive of *sterno.* The construction of these words is that called the ablative absolute, which has already been mentioned, and which will be fully explained in a later lesson.

10. *Triton.* Triton in Roman mythology was a sea-god, who heralded Neptune's approach. This whole sentence is but a poetic way of saying "calm weather will come."

11. *Utinam esses.* This is a recognised method of expressing a wish—"Would that you were."

13. *Quid. Quid si* is the regular phrase for "What if?"

14. *Tam male credis.* "Do you so foolishly trust?"

Expertae. This is a passive participle, though formed from a deponent verb.

15. *Ut.* "Even though."

Pelago suadente. Ablative absolute.

17-20. The general sense of these lines is as follows:—"The sea is a dangerous place for the treacherous, especially for those who have injured Love. For the story goes that the mother of Love sprang from the waters of Cythera." This alludes to the fable that Venus, the mother of Love, was born of the sea-foam.

21. *Ne perdam timeo.* As you will understand better presently, verbs of fearing are followed in Latin by *ne* and the subjunctive.

23. *Funere.* "By your death."

24. *Ferare.* Second person singular, present subjunctive of *fero.*

25. *Age.* This is the imperative of *ago.* It is an expletive, and does not affect the construction of the sentence. It may be translated, "come," "now."

Finge. Lit., this word means "form," "shape," but here it must be translated "suppose."

Nullum, &c. "May there be no weight in the omen." It is interesting to notice that the Romans were very superstitious, and did not like to suggest misfortunes as even possible, without deprecating the "omen" in some such expression as the present.

26. *Deprendi.* This is a contracted form of *deprehendi.*

Quid . . mentis. A genitive case often follows an indefinite pronoun. This construction is not unknown in England, but it is rare. Here we may translate, "What (state) of mind will be yours?"

27. *Occurrent.* "Will come to your mind."

28. *Phrygia fraude.* Lit., "by Phrygian deceit"—*i.e.*, "by the deceit of the Phrygian." Aeneas is termed a Phrygian, because he came from Troy, a city of Phrygia, in Asia Minor

Coacta. From *cogo*, which is contracted from *co-ago.*

31. The words in *italics* are what Dido supposes that Aeneas would say.

Concedite. "Begone"; this is addressed to the images pictured in the previous lines.

Dicas. "May you say." This word expresses a wish, as does *putes.*

33. *Saevitiae pelagique tuaeque.* "The fury of the sea and of thyself." You will notice that a genitive case is here coupled with a possessive adjective.

34. "The great reward of delay is a safe voyage by-and-by."

35. *Parcatur.* This is the present subjunctive passive of *parco* used impersonally. "Let it not be spared me"—*i.e.*, by you; or, to put it idiomatically, "Do not spare me." The argument is as follows: "Do not stay to spare me, but at least spare your son Iulus, and your household god, whom you saved from the flames of Troy, and who deserve a better fate than to be lost in the waves."

Iulo. The son of Aeneas, who two lines farther down is called Ascanius.

37. *Penates.* Every household in Rome had its special deities, which watched over its welfare. They were kept with a great reverence in a particular part of the house called the *Lararium.*

38. *Ignibus ereptos.* "Rescued from the fires of Troy." Aeneas was supposed to have saved his family and household gods.

40. *Sacra.* "The sacred images"—*i.e.*, the Penates.

41. *Nec enim tua,* &c. "Your tongue did not begin to deceive with me, nor was I the first to suffer."

A nobis. Lit., "From us," "starting from us."

43. *Mater Iuli.* The mother of Iulus, the wife of Aeneas, was Creusa, who died on the night that Troy was taken.

45. *Quin* is used after words implying doubt, &c. "My mind is not doubtful that"—*i.e.*, "I have no doubt in my mind that ——."

KEY TO TRANSLATION FROM OVID (p. 276).

Thus, when the Fates summon, lying in the wet herbage, sings the white swan by the waters of the Meander. I do not address you because I hope that you could be moved by any prayer of mine: I wished this with God opposed to me. But when I have sacrificed my services to you, and my good name, the chastity of both body and soul (*lit.* both my body and my chaste soul), it is a light matter to sacrifice words. Still, you are resolved to go and to leave the wretched Dido; and the same winds will carry away your sails and your plighted faith. You are resolved, Aeneas, to cast off your promise and your moorings, and to go in search of a kingdom of Italy, though you know not where it may be. Neither the new Carthage nor the rising walls influence you, nor the supreme power entrusted to your authority. You fly from what has been done, and seek what has to be done. Another land must be sought throughout the earth, though one has already been found by you. Supposing you find a land, who gives it to you to hold? Who will give his own fields to be possessed by strangers? Another love remains for you to have, another Dido; and another pledge must be given, which you again may break! When will it be that you build a city like Carthage, and on high look from your citadel upon your own people? Suppose all things turn out well, and your wishes delay you not, whence will you have a wife who shall love you as I do? It is Aeneas who always cleaves to my eyes while I am awake; it is Aeneas that day and night bring back to my mind! He, indeed, is ungrateful and deaf to all my kindnesses, and he is one of whom, were I not foolish, I should be glad to be rid. Yet I do not hate Aeneas, although he is evil-hearted; but I complain that he is faithless, and, complaining, I love him the more. Venus, spare thy daughter-in-law, and, brother Love, embrace thy hard hearted brother: let him fight in thy camp. I am deceived, and in vain is that thought presented to me. He differs from his mother's nature. Rocks and mountains, and oaks planted in lofty crags, wild beasts, produced you; or the sea, such as you see it now lashed by the winds; and yet you prepare to go thither, though the waves are against you.

BOTANY.—II.

[*Continued from p.* 274.]

THE CELL CONTENTS (*continued*)—THE CELL-WALL - CELL-FORMATION.

Plastids.—Besides the nucleus most cells contain some other bodies having a definite outline, multiplying only by division, and showing themselves to

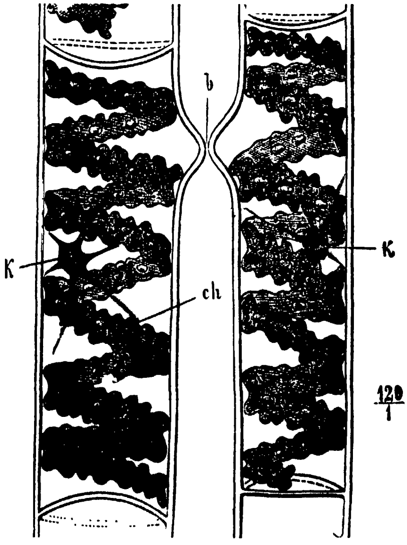
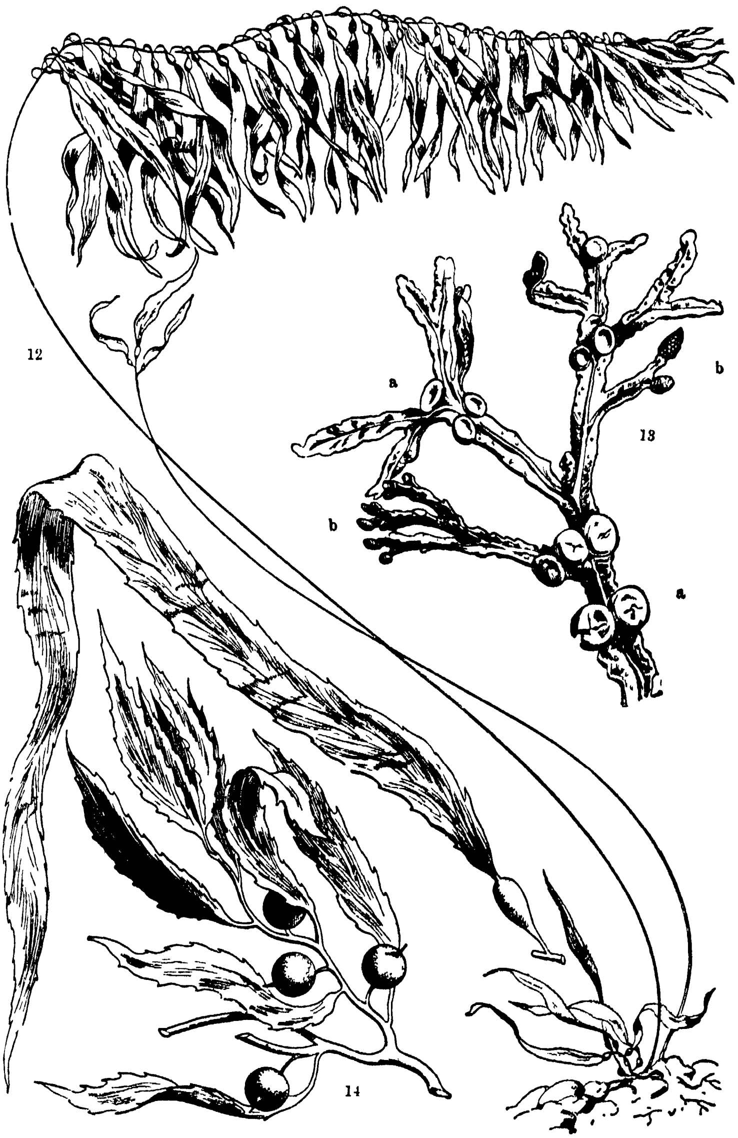


Fig. 11.—*Spirogyra*, a fresh-water alga. Two filaments, beginning to conjugate at *b*. *k*. nucleus. *ch*. chlorophyll-band. [Magnified 120 times.]

be albuminoid. Like the nucleus and its nucleoli, these bodies take stains more readily than the protoplasm. They are known as *plastids*, and are of three chief kinds, each of which seems capable under certain circumstances of changing into either of the others. They are *chloro-plastids*, *leuco-plastids*, and *chromo-plastids*.



Olive-brown Sea-weeds.

Figs.—12. *Macrocystis pyrifera* [reduced $\frac{1}{1000}$]. 13. *Fucus vesiculosus*, the Common Bladder-wrack [reduced $\frac{1}{2}$]—*a*, Air-bladders; *b*, Fertile branches. 14 *Sargassum bacciferum*, the Sargasso Weed.

Chloro-plastids.—Chloro-plastids, or chlorophyll-granules, are of the highest importance in the life of the plant, as they contain the green colouring-matter the presence of which is essential to the decomposition of atmospheric carbon dioxide and the formation of starch from inorganic matter. As Sachs says, "Only green parts of plants assimilate." Though sometimes in a spiral band as in the fresh-water alga *Spirogyra* (Fig. 11), in a star-like mass as in the allied *Zygnema* or hexagonal from mutual pressure, the chloro-plastids are generally globular granules with a protoplasmic body, showing a reticulate structure with fluid contents. The green colouring-matter, or *chlorophyll*, itself is of uncertain composition, being nitrogenous, and perhaps containing iron and phosphorus. It is soluble in alcohol, ether, or benzole, but not in water, and is not formed in the dark, at a low temperature, or in the absence of iron. In fern-fronds and the cotyledons, or seed-leaves, of some conifers, chlorophyll is apparently formed in the dark. The yellowish shoots of plants, which are under natural conditions green in colour, when grown in the dark are termed *etiolated*. In these cases, as in that of the celery, various other substances do not form. A solution of chlorophyll may be readily obtained by drying some grass in an oven and then boiling it in spirits of wine. In the ripening of fruits and in the colour-changes of autumn leaves the chlorophyll appears to be decomposed. It is absent, as we have seen, in all fungi, and in some parasitic and saprophytic flowering-plants (*see* p. 271); but when present it is sometimes masked by other colouring-matters. These are commonly soluble in water. The olive-brown sea-weeds, for instance (Figs. 12, 13, 14), if boiled in water become bright green. The exact mode in which the chlorophyll acts is not known; but, in the presence of light, chlorophyll, and carbon dioxide, some soluble carbo-hydrate, such as grape-sugar, seems to be formed, soon after which visible granules of starch appear in the chloro-plastids. It is suggested that the carbon dioxide from the air may combine with water from the soil to form such a substance as formic aldehyde, thus setting free oxygen equal in volume to all that in the carbon dioxide. It will be noticed that grape-sugar is a multiple or "polymer" of formic aldehyde.

Leuco-plastids.—Leuco-plastids (Greek λευκὸς, *leukos*, white), or colourless starch-forming corpuscles, are found in the interior cells of plants, away from the influence of light, adhering to the broad ends of starch-grains. Being easily destroyed even by water, they are difficult to observe; but in *Phajus* and other orchids a transition can be traced from chloro-plastids near the exterior to leuco-plastids, the two kinds of plastids being convertible. Leuco-plastids do not assimilate, their function being to re-form starch, (especially in structures acting as food-reservoirs) from soluble carbo-hydrates. They have thus only to go through the later stages of starch-formation. In the leuco-plastid there is commonly a crystalloid.

Chromo-plastids.—Some of the colouring-matters in plants, blues, violets, and some reds, occur diffused in the cell-sap; others, mainly reds and yellows, are commonly crystalline, giving angular forms to the protoplasmic granules or *chromo-plastids* (Greek χρῶμα, *chrōma*, colour) in which they occur.

Starch.—Chief among the solid contents of cells are the granules of *starch*. This substance occurs in all green plants, and originates, as we have seen, within the chloro-plastids of the leaves or other green parts under the influence of light. It is insoluble in cold water; but on the addition of boiling water the granules swell up, as is familiar to all in the case of puddings made from such starches as sugar or tapioca. In order that the starch may pass from the cells in which it is first formed, it has to become soluble, passing, as it will when heated or acted on by dilute sulphuric acid, into *dextrin* or British gum, or, by a process of fermentation, into sugar. Dextrin is now largely manufactured from potatoes and other starches for postage-stamps, &c. The fermentation that converts starch into sugar is apparently a rapid hydration due to the action of a nitrogenous ferment known as *diastase*, which may be present in every living plant-cell. It forms *maltose* or *malt-sugar*, and this sugar by further hydration passes into *glucose* or *grape-sugar*. In this way the elements of the starch are conveyed either to the growing parts of the plant, or to such structures as roots, tubers, or other underground stems, the young wood of trees, or seeds, where, under the influence of leuco-plastids, they are re-formed into starch-grains. These granules have a central liquid spot or *hilum*, round which are a series of eccentrically concentric coats (Fig. 15, *k*). These seem to be formed of two somewhat distinct substances, *granulose* and *farinose*. *Granulose*, which forms 94 to 96 per cent. of the grain, turns blue when treated with iodine, and is readily soluble in the saliva of the mouth, or in dilute acid. *Farinose* or *starch-cellulose*, forming a skeleton to the granule, is less soluble, turns brown, or remains unstained, by iodine, and is mainly digested in the intestines (*See* lessons on Human Physiology, Vol. I., pp. 334 and 336). The starch-grains are of a constant shape and size in each species, and as they form the bulk of such food-stuffs as flour, rice, potato-meal, sago, arrowroot, &c., their characters are important aids in detecting adulteration Among the smallest are those of rice, less than $\frac{1}{5000}$ of an inch across; whilst the largest are those of "Tous-les-mois" (*Canna*), $\frac{1}{300}$ in. The position of the leuco-plastid at the broad end of the grain points to the mode of growth of the latter being by *apposition—i.e.*, the addition of new layers externally. When seeds germinate naturally or, as in malting, artificially, or when growth recommences with the putting forth of new buds and shoots in spring, the store of starch passes by fermentation into sugar. Then it is that such trees as the birch and the sugar-maple are tapped for their sweet sap.

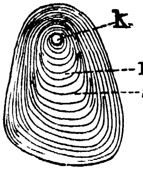


Fig. 15. — Starch-grain of potato— *k*, hilum; *r*, *a*, coats varying in proportions of water.

Inulin.—In the tubers of the Jerusalem Artichoke (*Helianthus tuberosus*), the roots of *Dahlia* and other Compositæ, starch is replaced by an allied carbo-hydrate, *inulin*. It is soluble in cold water, and only occurs in solution in living cells; but is precipitated by alcohol in spherical groups of crystals, sometimes extending into several cells. It is not stained by iodine.

Sugars.—*Grape-sugar* is, as we have seen, an early product of assimilation, and one of the chief forms in which carbo-hydrate food travels through the plant. *Cane-sugar* seems in the beet-root to be stored up as a reserve.

Acids.—These occur dissolved in the cell-sap, the chief being *malic*, *tartaric*, *citric*, and *oxalic*. Though mainly by-products, they serve various purposes. Oxalic acid decomposes salts absorbed by the roots, and any acid in the root-hairs may aid in the solution of some substances in soil. They also produce fermentative changes of importance.

Aleurone.—Just as the carbo-hydrate food is stored up in starch-grains, so in some seeds, tubers, &c., the nitrogenous food exists in solid granules known as *aleurone-grains*. These are well seen in peas, in the outer part of the seed of wheat, or in the seeds of the Castor-oil plant (*Ricinus*). They are enclosed in a membrane, but are soluble in caustic potash, and generally contain crystalloids and globoids.

Crystalloids and Globoids.—Albuminoid matter, especially in plastids, often takes on sub-angular forms known as *crystalloids*, which swell up in caustic potash. *Globoids*, on the other hand, are spherical masses of a definite double phosphate of calcium and magnesium, soluble in acetic acid, occurring within the aleurone-grains.

Crystals.—True crystals, either needle-like, when they are known as *Raphides* (Greek, ῥαφίδες, needles), tabular, or in more or less spherical aggregations known as *Sphæraphides*, occur in the wall and sap of many cells. They consist of calcium sulphate, carbonate, phosphate, or most commonly oxalate. The latter substance is present in all plants, especially where chemical nutritive changes (metabolism) are active. Plants commonly take in, from the soil, calcium sulphate, the sulphuric acid of which gives its sulphur to the albuminoids, whilst the lime serves to neutralise the oxalic acid, a poisonous by-product in the plant, thus forming these crystals. They abound in the stems of Cacti, forming sometimes 80 per cent. of their dried tissue, and in autumn leaves. In the leaves of figs, mulberries, hops, and allied plants, club-shaped ingrowths of the cell-wall occur, in which numerous crystals of calcium carbonate, known as *cystoliths*, are imbedded.

Cell-sap.—The watery cell-sap, which fills the vacuoles, and often the entire cell, consists mainly of water, but contains dissolved in it the sugars, acids, inuline, soluble colouring-matters, &c.

Resins, Tannin, Aromatic Substances, &c.—In addition to these substances, the physiological use of which is mainly known, other compounds occur in plants, which, though of the highest utility to man, are apparently, physiologically speaking, *waste-products*. Such are the *volatile* or *essential oils*, of which terpenes are important constituents, and to which perfumes and flavours are largely due; the oxidised *stearoptenes*, such as camphor and menthol; the insoluble *resins* such as copal and dammar, generally in special secreting organs; the soluble *gums*, generally exuded by the plant, such as gum arabic; the *gum-resins*, or mixtures of gum and resin; the *oleo-resins*, or solutions of resin in essential oil, such as turpentine; the *balsams*, fragrant oleo-resins containing a fragrant acid; the *rubbers*, such as caoutchouc and gutta; the generally distributed *astringent* tannin; the *bitter principles*, such as quasiin; and the nitrogenous *alkaloids*, such as morphia and strychnia. The *fixed oils*, including the *fats* and *waxes*, generally to some extent replace starch, and are part of the food-store of the plant; but they may be exuded, as in the case of the waxy "bloom" on fruits and leaves.

The Cell-Wall: its Changes.—The cells of which plants are mainly composed are enclosed in a membrane formed originally of *cellulose*. Possibly all the inner cells, at least, of the higher plants have their walls perforated by threads of protoplasm. The cell-wall may undergo one of three chief changes—lignification, cuticularisation, or conversion into mucilage. When unaltered, as in the hairs on the seed of *Gossypium*, which we know as cotton, cellulose is insoluble in water, alcohol, or dilute acid; turns blue on treatment with iodine and sulphuric acid; and is soft, flexible, permeable, and absorbent. With strong sulphuric acid it is converted first into dextrin, and then into glucose, an important manufacture. *Lignification*, or conversion into *wood*, takes place especially in certain cells in perennial stems, and in the "stone" of some fruits. It consists in the infiltration of the cellulose by *lignin*, a substance richer in carbon, which renders it hard, less flexible, less permeable, and less absorbent, and turns brown with iodine and sulphuric acid. *Cuticularisation*, suberisation, or conversion into *cork*, which occurs especially in the walls of epidermal and hypodermal cells, consists in a similar infiltration by *cutin*, rendering the cell-wall highly elastic, non-absorbent, almost impermeable to water, and capable of resisting strong acid. Cork turns yellow under iodine and sulphuric acid. *Conversion into mucilage* is a less change, occurring, for instance, in the outer coat of the seed of flax (linseed), in which the cell-wall becomes horny but highly absorbent, swelling up when moistened, but still turning blue with iodine and sulphuric acid. The chief purpose of lignification would seem to be strength, since the elements of submerged plants, which do not require support, are not lignified. Cuticularisation checks transpiration. A peeled apple, for instance, will shrivel far more rapidly than one with the cuticularised outer tissue intact. In resisting acid cork may also resist some secretions of fungal parasites. Cuticle offers little resistance to the passage of gases.

Thickening of the Cell-Wall.—When once formed the wall of a cell increases in superficial area mainly by stretching, and this sometimes to a great extent. There are, for example, only the same number of cells in a horse-chestnut leaf when fully expanded as when it first leaves the bud. To permit of such stretching most cell-walls become thickened by the successive addition of new layers of cellulose, or its modifications, on the inner surface of the originally thin simple membrane. This thickening seldom extends over the whole wall. In rapidly elongating structures, such as the young wood (primary xylem) of stems, it may be in rings (*annular*, *see* Fig. 16 A), or in a *spiral* band (*see* Fig. 16 C). In the stems of ferns thickening occurs in transverse bars, like the rungs of a ladder, and hence called *scalariform*. In other cases it forms an irregular network (*reticulate*, *see* Fig. 16 B). Or again the wall may be thickened all over with the exception of a few spots, known as *pits*, which remain uncovered by each successive layer and on both sides of the cell-wall, thus forming canals, known as *pore-canals*, by which the cavities of the cells communicate. Sometimes the pits are confined to particular parts of the cell-wall, as in the *sieve-plates* of the *sieve-tubes* (*see* Fig. 17) in the bast, or inner bark. In the wood of firs and their allies especially, a noticeable form of pit occurs, known as a *bordered pit*, in which each successive layer projecting over the unthickened spot forms a funnel-shaped pit which gives the appearance by transmitted light of a bright spot with a ring round it. The unthickened spot is often absorbed, forming a perforation.

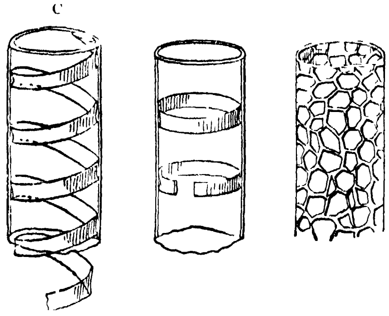


Fig. 16.—THICKENING OF CELL-WALLS.
A, annular; B, reticulate; C, spiral.

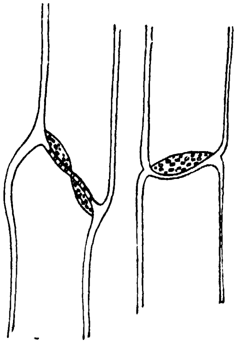


Fig. 17.—SIEVE-PLATES OF THE SIEVE-TUBES.

Cell-formation.—New cells may originate by *rejuvenescence*, the whole protoplasm of a cell starting life afresh, or by *conjugation*, the union of two or more masses of protoplasm (primordial cells); but the chief method is by the *division* of a pre-existing cell. This takes place in two chief ways, both of which begin by the division of the nucleus into two. In vegetative cells a partition wall forms across the cell between the two new nuclei (*see* Fig. 18). In spores and pollen-grains the protoplasm contracts round each nucleus and secretes a new wall right round itself, so that the *daughter-cell* is free in the cavity of the *mother-cell*. This is called *free cell-formation*.

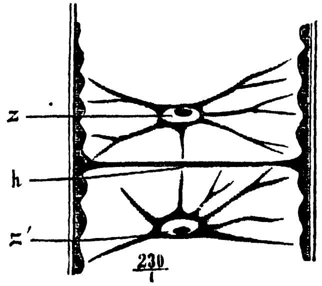


Fig. 18.
Cell-division in *Spirogyra* (after Strasburger) [magnified 230 times]. *z z'*, Daughter-nuclei; *h*, Newly formed cell-wall.

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